U. S. DEPARTMENT OF LABOR
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CAUSAL FACTORS IN INFANT MORTALITY

A STATISTICAL STUDY BASED ON INVESTIGATIONS IN EIGHT CITIES

BY

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CONTENTS

	Page
Letter of transmittal	XI
Introductory summary	1
Basic material and methods of analysis	10
Basis of study	10
Limitations of material	10
Methods of field studies	11
Methods of analysis	12
Pathological causes of death	16
Causes peculiar to early infancy	16
Gastric and intestinal diseases	18
Respiratory diseases	19
Epidemic and other communicable diseases	19
Malformations	20
Other causes	20
Significance of comparisons with rates in birth-registration cities and in New Zealand	21
Age of infant	23
Seasonal conditions	26
Month of birth	28
Sex of infant	31
Physical condition of mother	33
Death of mother	33
Causes of death of infant	34
Prematurity	34
Type of feeding	35
Tuberculosis of mother	35
Complications of pregnancy and confinement	36
Medical care during pregnancy	36
Summary	37
Frequency of births	39
Age of mother	39
Causes of death of infant	40
Neonatal mortality	40
Order of birth	40
Interval since preceding birth	42
Prematurity	43
Plural births	44
Type of feeding	45
Color and nationality of mother	46
Earnings of father	46
Summary	47
Order of birth	48
Causes of death	49
Neonatal mortality	49
Age of mother	49
Interval since preceding birth	51
Age of mother and interval since preceding birth	51
Prematurity	52
Plural births	53
Type of feeding	54
Color and nationality of mother	55
Earnings of father	56
Per capita earnings	57
Summary	59
Interval since preceding birth	60
Causes of death	61
Neonatal mortality	61
Age of mother and order of birth	62

Frequency of births—Continued.
Interval since preceding birth—Continued. Page
Prematurity 63
Plural births 63
Type of feeding 64
Color and nationality of mother 65
Earnings of father 66
Summary 67
Interval before succeeding pregnancy 67
Type of feeding 69
Color and nationality of mother 69
Earnings of father 69
Summary 70
General summary 70
Type of birth 72
Prematurity 72
Causes of death 72
Neonatal mortality 73
Plural births 73
Sex 73
Death of mother 74
Type of feeding 75
Other factors 76
Causes of prematurity 77
Summary 78
Plural births 78
Causes of death 79
Neonatal mortality 79
Prematurity 80
Causes of death and prematurity 80
Type of feeding 80
Prematurity and type of feeding 82
Other factors 83
Mortality among pairs of twins 84
Causes of plural births 85
Summary 86
Type of delivery 86
Type of feeding 88
Prevalence of breast and artificial feeding 88
Monthly death rates, by type of feeding 89
Influence of changes in feeding 91
Cumulative influence of early artificial feeding 93
Causes of death 94
Plural births, prematurity, and death of mother 96
Color and nationality of mother 99
Employment of mother during first year of infant's life 100
Earnings of father 101
Varying prevalence of early artificial feeding 102
Summary 103
Color and nationality of mother 104
Causes of death of infant 105
Neonatal mortality 105
Plural births and prematurity 106
Death of mother 107
Plural births, prematurity, and death of mother 108
Instrumental delivery 109
Frequency of births 110
Age of mother 110
Order of birth 110
Interval since preceding birth 111
Interval before succeeding pregnancy 113
Type of feeding 113
Housing congestion 116
Employment of mother during pregnancy 117
Employment of mother during first year of infant's life 119
Earnings of father 121
Earnings of father and type of feeding 123
Summary 124

Page

Housing congestion 125
Causes of death 125
Type of feeding 126
Color and nationality of mother 126
Earnings of father 127
Earnings of father and nationality of mother 129
Summary 129
Economic factors 131
Employment of mother during pregnancy 131
Causes of death of infant 132
Neonatal mortality 132
Interval between cessation of work and confinement 133
Prematurity 134
Type of feeding 134
Color and nationality of mother 135
Earnings of father 136
Employment of mother during infant's life 137
Causes of employment of mother during pregnancy 138
Summary 138
Employment of mother during first year of infant's life 139
Causes of death 141
Interval between confinement and resumption of work 141
Type of feeding 142
Color and nationality of mother 143
Earnings of father 144
Causes of mother's employment during infant's life 145
Summary 146
Earnings of father 146
Additional income 148
Earnings per capita of family 149
Causes of death of infant 150
Neonatal mortality 151
Plural births, prematurity, and death of mother 151
Age of mother, order of birth, interval since preceding birth, and interval before succeeding pregnancy 152
Type of feeding 155
Color and nationality of mother 156
Housing congestion 157
Employment of mother during pregnancy 158
Employment of mother during first year of infant's life 160
Chain of causation linking earnings of father and infant mortality 162
Causes of low father's earnings and of low per capita income 163
Summary 164
Appendix A.—Stillbirths 167
Appendix B.—Method of study 174
Appendix C.—Method of analysis 184
Appendix D.—General tables 186
Appendix E.—Charts 237

GENERAL TABLES

Table 1.—Cause of death, by month of life in which death occurred; infant deaths in eight cities 186
Table 2.—Cause of death, by calendar month of birth; infant deaths in eight cities 187
Table 3.—Month of life in which death occurred, by calendar month of birth; infant deaths in eight cities 187
Table 4.—Infant mortality rates, by sex and term; live births in eight cities 188
Table 5.—Prevalence of artificial feeding, by sex and month of life; infants in eight cities 188
Table 6.—Proportion of births to mothers of nationalities with high infant mortality rates, by sex; live births in eight cities 188
Table 7.—Infant mortality, by cause of death, term, and interval between confinement and death of mother; births in eight cities to mothers who died at or within one year after confinement 189

Page

Table 8.—Type of feeding, by month of life; infants in eight cities whose mothers died at or within one year after confinement 189
Table 9.—Prevalence of breast and artificial feeding, by death or survival of mother during year after confinement; infants in eight cities 190
Table 10.—Mortality among infants whose mothers died at or within one year after confinement as compared with all other infants, when influence of differences in type of feeding is eliminated; infants in eight cities 190
Table 11.—Causes of death of infants in Baltimore, according to whether mother had had tuberculosis 190
Table 12.—Proportion of births to mothers in Baltimore who had convulsions as a complication of confinement, by term and cause of infant's death 191
Table 13.—Infant mortality rates, by cause of infant's death and medical prenatal care of mother; live births in Baltimore 191
Table 14.—Monthly death rates, by age of mother and month of life; infants in eight cities 191
Table 15.—Age of mother, by order of birth; live births in eight cities 192
Table 16.—Relative mortality, by age of mother, when influence of order of birth, interval since preceding birth, and both factors together, is eliminated; live births in eight cities and live births in Baltimore 192
Table 17.—Order of birth, by interval since preceding birth and age of mother; single live births in Baltimore second and later in order 193
Table 18.—Proportion of births following preceding birth at short intervals, by order of birth and age of mother; single live births in Baltimore 194
Table 19.—Proportion of premature births, by age of mother, when influence of order of birth is eliminated; live births in eight cities 194
Table 20.—Relative mortality, by age of mother, when influence of prematurity is eliminated; live births in eight cities 194
Table 21.—Proportion of confinements with instrumental delivery, by age of mother; confinements in Baltimore 195
Table 22.—Prevalence of artificial feeding, by age of mother and month of infant's life; infants in eight cities 195
Table 23.—Age of mother, by color and nationality of mother; live births in eight cities 195
Table 24.—Age of mother, by earnings of father and whether first or later births; live births in seven cities 196
Table 25.—Age of mother, by per capita income from father's earnings; live births in seven cities 196
Table 26.—Monthly death rates, by order of birth and month of life; infants in eight cities 197
Table 27.—Relative mortality, by order of birth, when influence of prematurity and plurality of birth is eliminated; live births in eight cities 197
Table 28.—Relative mortality, by order of birth, when influence of interval since preceding birth, and when influence of both interval since preceding birth and age of mother is eliminated; single live births in Baltimore second and later in order 197
Table 29.—Proportion of confinements with instrumental delivery, by order of birth; confinements in Baltimore 198
Table 30.—Prevalence of artificial feeding, by order of birth and month of life; infants in eight cities 198
Table 31.—Order of birth, by color and nationality of mother; live births in eight cities 198
Table 32.—Order of birth, by earnings of father; live births in seven cities 199
Table 33.—Order of birth, by per capita income from father's earnings; live births in seven cities 199
Table 34.—Monthly death rates, by interval since preceding birth and month of life; infants in Baltimore 199
Table 35.—Per cent of premature births, by order of birth and interval since preceding birth; live births in Baltimore 200

Page

Table 36.—Prevalence of artificial feeding, by interval since preceding birth and month of life; infants in Baltimore 200
Table 37.—Interval since preceding birth, by color and nationality of mother; live births in Baltimore 200
Table 38.—Interval since preceding birth, by earnings of father; live births in Baltimore second and later in order 201
Table 39.—Interval since preceding birth, by per capita income from father's earnings; live births in Baltimore 201
Table 40.—Prevalence of breast and artificial feeding when mother became pregnant; infants in Baltimore whose mothers became pregnant during first year of infant's life 201
Table 41.—Cause of death, by month of life in which death occurred; deaths among infants in eight cities whose mothers became pregnant in some preceding month 202
Table 42.—Type of feeding during months lived to end of ninth and after commencement of mother's subsequent pregnancy; infants in eight cities whose mothers became pregnant during infant's first year 202
Table 43.—Type of feeding after beginning of mother's subsequent pregnancy, by month of life; infants in Baltimore whose mothers became pregnant during first year of infant's life 202
Table 44.—Cause of death, by term; infant deaths in eight cities 203
Table 45.—Monthly death rates, by month of life and term; infants in eight cities 203
Table 46.—Infant mortality and stillbirth rates, by period of gestation and single and plural births; births in eight cities 204
Table 47.—Proportion of births to mothers who died at or within one year after confinement, by term; live births in eight cities 204
Table 48.—Type of feeding, by month of life and period of gestation; infants in eight cities 205
Table 49.—Prevalence of breast and artificial feeding during first nine months, by term and single and plural births; months lived by infants in eight cities 205
Table 50.—Proportion of births fifth and later in order, by term; live births in eight cities 206
Table 51.—Proportion of births to mothers under 20 and to those 35 years of age and over, by term; live births in eight cities 206
Table 52.—Proportion of births following preceding births after short intervals, by term; live births in Baltimore 206
Table 53.—Proportion of births to mothers of nationalities with high infant mortality rates, by term; live births in eight cities 206
Table 54.—Proportion of births in families in which fathers earned less than $650, by term; live births in seven cities 207
Table 55.—Proportion of births to mothers employed away from home during pregnancy, by term; live births in eight cities 207
Table 56.—Death in infancy and survival of twins in pairs, by character of birth and period of gestation; twins in eight cities 207
Table 57.—Monthly death rates, by month of life and single and plural births; infants in eight cities 208
Table 58.—Type of feeding, by month of life and single and plural births; infants in eight cities 208
Table 59.—Weaning of twins in pairs, by age when first twin was weaned; twins in six cities 209
Table 60.—Proportion of births to mothers under 20 and to those 35 and over, by single and plural births; live births in eight cities 209
Table 61.—Proportion of births fifth and later in order, by single and plural births; live births in eight cities 209
Table 62.—Relative mortality among plural and single births, when influence of age of mother, order of birth, and both factors is eliminated; live births in eight cities 210
Table 63.—Proportion of births to mothers of nationalities with high infant mortality rates, by single and plural births; live births in eight cities 210
Table 64.—Proportion of births in families in which fathers earned less than $650, by single and plural births; live births in eight cities 211

Page

Table 65.—Prevalence of plural births among births preceded by plural births; all pregnancies reported by mothers of infants in eight cities 211
Table 66.—Proportion of confinements in families in which father earned less than $650, by type of delivery; confinements in Baltimore 211
Table 67.—Monthly death rates, by cause of death, type of feeding, and month of life; infants in eight cities 212
Table 68.—Monthly death rates of infants artificially fed, by month of life in which artificial feeding began; infants artificially fed in eight cities 214
Table 69.—Monthly mortality of infants artificially fed, by month of life in which artificial feeding began; single, full-term live births in eight cities to mothers who survived first year of infant's life 215
Table 70.—Monthly death rates, by month of life and color and nationality of mother; infants in eight cities 215
Table 71.—Type of feeding, by color and nationality of mother; months lived from birth to end of ninth by infants in eight cities 216
Table 72.—Prevalence of breast and artificial feeding, by month of infant's life and color and nationality of mother; infants in eight cities 216
Table 73.—Monthly death rates, by color and nationality of mother and by month of life and type of feeding; infants in eight cities 219
Table 74.—Relative mortality, by nationality of mother, for infants not fed and for infants receiving each type of feeding; eight cities 220
Table 75.—Color and nationality of mother, by average number of persons per room; infants in seven cities who survived two weeks 221
Table 76.—Earnings of father, by color and nationality of mother; live births in seven cities 221
Table 77.—Average per capita income from father's earnings, by color and nationality of mother; live births in seven cities 222
Table 78.—Monthly death rates, by month of life and average number of persons per room; infants in seven cities who survived two weeks 223
Table 79.—Prevalence of artificial feeding in selected months, by average number of persons per room; infants in seven cities who survived two weeks 224
Table 80.—Earnings of father, by average number of persons per room; infants in seven cities who survived two weeks 224
Table 81.—Average number of persons per room, by per capita income from father's earnings; infants in seven cities who survived two weeks 224
Table 82.—Monthly death rates, by month of infant's life and employment of mother during pregnancy; infants in eight cities 225
Table 83.—Proportion of plural births, by employment of mother during pregnancy; live births in eight cities 225
Table 84.—Prevalence of artificial feeding, by month of life and employment of mother during pregnancy; infants in eight cities 225
Table 85.—Employment of mother away from home, by interval between cessation of work and confinement, and earnings of father; live births in seven cities 226
Table 86.—Employment of mother during pregnancy, by her employment during first year of infant's life; infants in eight cities 226
Table 87.—Type of feeding in month in which mother went to work, by place of her employment; infants in eight cities surviving when mothers went to work 227
Table 88.—Type of feeding, by month of infant's life and place of mother's employment; infants in eight cities whose mothers were employed during some preceding month of infant's life 228
Table 89.—Type of feeding during first nine months of life, by employment of mother; infants in eight cities 228
Table 90.—Earnings of mother, by earnings of father; infants in seven cities whose mothers were employed during first year of infant's life 229

Page

Table 91.—Earnings of children in family, by earnings of father; live births in seven cities in families in which one or more children worked during year following the births 229
Table 92.—Infant mortality rates, by total annual income of family and earnings of father; live births in seven cities 230
Table 93.—Earnings of father, by average per capita income from father's earnings; live births in seven cities 230
Table 94.—Infant mortality rates, by cause of death and economic need; live births in seven cities 231
Table 95.—Monthly death rates, by month of infant's life and earnings of father; infants in seven cities 231
Table 96.—Proportion of plural births, by earnings of father; live births in seven cities 232
Table 97.—Proportion of births to mothers who died at or within one year after confinement, by earnings of father; live births in seven cities 232
Table 98.—Relative infant mortality, by earnings of father, when influence of age of mother and order of birth, and of interval since preceding birth is eliminated; single live births in seven cities and live births in Baltimore 232
Table 99.—Prevalence of breast and artificial feeding, by month of infant's life and earnings of father; infants in eight cities 233
Table 100.—Type of feeding during first nine months of life, by earnings of father; infants in seven cities 234
Table 101.—Monthly death rates, by type of feeding, earnings of father, and month of life; infants in seven cities 235
Table 102.—Infant mortality rates, by earnings of father and color and nativity of mother; live births in seven cities 236
Table 103.—Proportion of confinements with instrumental delivery, by earnings of father; confinements in Baltimore 236

CHARTS

Chart I.—Deaths from respiratory and from gastric and intestinal diseases, by month of death 237
II.—Monthly death rates, by month of life 238
III.—Infant mortality rates, by age of mother 239
IV.—Infant mortality rates, by order of birth 240
V.—Infant mortality rates, by interval since preceding birth 241
VI.—Infant mortality rates for single and plural, premature and full-time births 242
VII.—Relative mortality, by type of feeding 243
VIII.—Infant mortality rates, by color and nationality of mother 244
IX.—Infant mortality rates, by color and nativity of mother and earnings of father 245

LETTER OF TRANSMITTAL

U. S. Department of Labor,
Children's Bureau,
Washington, February 25, 1925.

Sir: There is transmitted herewith a report on Causal Factors in Infant Mortality, by Dr. Robert Morse Woodbury, director of statistical research in the Children's Bureau. This report is a summary of the detailed studies of infant mortality made by the bureau in eight cities.

The much larger number of infants for which material is available in this consolidated report permits an extended analysis of some of the more important factors in infant mortality and affords the basis for conclusions as to causes not considered in the reports on individual cities because of the relatively smaller numbers. In the analysis Dr. Woodbury has used the method of expected deaths developed by Prof. Harald Westergaard, of the University of Copenhagen, in order to isolate the influence of each cause under consideration.

Respectfully submitted.

Grace Abbott, *Chief.*

Hon. James J. Davis,
Secretary of Labor.

CAUSAL FACTORS IN INFANT MORTALITY

INTRODUCTORY SUMMARY

A thorough knowledge of the causes of infant mortality is the first step toward their complete control. In the light of such knowledge preventive measures may be intelligently planned to produce a maximum of result. These measures may be aimed to prevent the spread of specific infectious diseases—for example, vaccination for smallpox, the Schick test and toxin-antitoxin immunization against diphtheria, disinfection of the eyes to prevent ophthalmia neonatorum, or the practice of surgical cleanliness to prevent tetanus and other infections immediately following birth. They may be directed toward the control of gastric and intestinal diseases, to effect which involves not simply the prevention of infection but the inculcation of right principles of infant feeding. Again, they may be directed toward the control of the mortality of early infancy, the main causes of which lie in the care and condition of the mother during pregnancy and childbirth.

The pathological causes of infant deaths must be reported on death certificates by the physicians in attendance. These certificates therefore, state the specific condition or disease that resulted in death, whether malformation, congenital debility, enteritis, measles, or some other cause. They furnish the basis for the preliminary study of causes of death and also for an index of the maximum limit of efficacy of measures of prevention, so far as those measures are directed toward the control of particular causes of death.

But the analysis, if it is to be thorough, must be carried beyond the pathological cause to antecedent and predisposing causes and causal factors. Differences in inborn vigor or vitality may account in part for differences in the rates for the different races, even as they may account for differences in the rates for male and female infants or for twins and triplets and single-born infants. The prejudices and traditions of certain race groups have their influence upon the infant mortality rates for these races, as, for example, the custom of mothers of Portuguese extraction of giving "sopa," a dish prepared from softened crackers, to babies a few hours old, or the preference of Italian women to be attended at confinement by midwives and their custom of wrapping their "bambinos" in swaddling clothes. The influence of type of feeding and other elements of infant care demands careful consideration in the study of causes of infant mortality.

The program recommended for pregnant women by medical authorities includes supervision by a physician, nourishing food, rest, and freedom from worry and overwork. These excellent prescriptions cost money; and the mother who is struggling to make ends meet upon a meager income may be unable to follow such

recommendations. The analysis, therefore, must also attempt to assess the importance of insufficiency of income as an underlying cause. The comparison of mortality rates in the different income groups should indicate to what extent infant mortality might be prevented if the most favorable conditions prevailed among all groups. Another important element in the condition of the mother which may affect her baby's chances of life is whether or not she is employed; it is important, therefore, to ascertain the nature and extent of the influence of the mother's employment upon infant mortality. In the present study an attempt is made to evaluate these underlying, as well as the pathological, causes of infant mortality.

The data available for analysis consisted of nearly 23,000 records of infants born in eight cities and the deaths under 1 year of age among them. The infant mortality rate from all causes in the group studied was 111.2 per 1,000 live births.

Pathological causes of death.

The group of causes peculiar to early infancy was first in importance and was responsible for nearly one-third of the deaths under 1 year; the rate of mortality from these causes was 36.1. Gastric and intestinal diseases were not far behind with a rate of 32.4. Respiratory diseases ranked third with a mortality of 19.6; and the rate from epidemic and other communicable diseases was 7.1.

Age of infant.

The mortality rate decreased month by month during the first year of life, dropping from 44.8 in the first to 9.3 in the second month and falling more slowly in the following months to 4.5 in the twelfth. The trend of the mortality rates from the several causes varied markedly with increasing age: From causes peculiar to early infancy the mortality dropped from 30.3 in the first to practically negligible figures in later months. From respiratory diseases it decreased gradually from 2.9 in the first to 1.2 in the twelfth month. From epidemic and other communicable diseases the rates varied in trend according to the specific cause. From gastric and intestinal diseases the rate increased from 3 in the first to a maximum of 3.8 in the sixth month, after which time it decreased to 1.8 in the twelfth month. Upon analysis this change in incidence was found to be influenced by type of feeding; among the exclusively breast fed the mortality from these diseases showed a continuous decrease from the first month, whereas among the exclusively artificially fed the rate, which was relatively very much higher, increased from 8.3 in the first to a maximum of 11.1 in the third month. The trend of the average rates of mortality from these diseases was influenced largely by transfers from breast to artificial feeding during the early months of life.

Seasonal conditions.

Marked differences in mortality in different seasons were found, which varied according to the cause of death. From gastric and intestinal diseases the maximum mortality occurred in August and was 13 times the minimum, which occurred in January. From respiratory diseases the maximum mortality, in February, was seven times the minimum, in August. Epidemic and other communicable

diseases appeared to have been slightly more prevalent in the late winter and early spring than in the other months.

Month of birth.

The mortality was lowest for infants born in August and highest for those born in June. Since the variation in the seasonal incidence of gastric and intestinal diseases was greatest, the differences in mortality rates for infants born in different months were determined largely by the relation which the month of birth bore to the infants' ages when they were exposed, during the summer, to the heaviest incidence of these diseases.

Sex.

The mortality rate for male was about one-fourth higher than that for female infants. This excess mortality among males was found for practically every cause of death and among both the prematurely born and those born at term. Though greater difficulty of labor in case of male births might explain the excess mortality from causes peculiar to early infancy, the greater mortality from other causes appears to be explainable only by differences in vitality to the disadvantage of the male sex.

Physical condition of mother.

Though the information obtained relating to the physical condition of the mother was limited to a comparatively few points, each of these points appeared to exert a great influence over infant mortality.

Infants of mothers who died within one year after confinement had a mortality from all causes which was over four times and a mortality from causes peculiar to early infancy which was seven times the corresponding rates for those whose mothers lived for a year or more after confinement. Among infants whose mothers died within one month the excess mortality was especially great. A disproportionate number of infants whose mothers died within one year were prematurely born, and a disproportionate number were artificially fed; but neither the greater prevalence of prematurity nor the greater amount of artificial feeding was sufficient to account for their much heavier mortality.

A small group of infants whose mothers were known to have had tuberculosis had a mortality from all causes, and especially from tuberculosis, which was greatly in excess of that among other infants.

The mortality among infants whose mothers were reported to have had convulsions as a complication of pregnancy or confinement was three and one-half times the average, the excess mortality being due largely to causes peculiar to early infancy.

Other points which are associated closely with the mother's health or physical condition during pregnancy and at confinement are discussed under the following topics: Age of mother, order of birth, employment of mother during pregnancy, and earnings of father.

Frequency of birth.

The factors which together produce the influences upon infant mortality frequently associated with the birth rate are order of birth, age of mother, interval since preceding birth, and interval before succeeding pregnancy.

Order of birth.—The mortality rate for first-born was slightly higher than that for second-born infants. On analysis this excess

mortality among first-born infants was found to be due largely to a higher death rate from causes peculiar to early infancy and to a greater proportion of premature births. From gastric and intestinal and from respiratory diseases, on the other hand, the mortality among first-born was less than that among later-born infants.

When the first born were left out of account the mortality rate tended to increase with order of birth. The analysis indicated that this tendency was associated primarily with increasing economic pressure as the number of children in the family increased, for when allowance was made for this factor, so far as the material permitted, the higher mortality found among the later orders largely disappeared.

Age of mother.—Among the first born the infants of mothers under 20 and of those 40 years of age and over had the highest mortality rates. These variations were probably associated with physical immaturity or with changes in the physical condition of the mother.

Among the second and later born the age of the mother appeared not to exert any marked influence as distinguished from other factors with which it was associated. The high rate found for infants of the youngest mothers was explainable in part by short-interval births and in part by relatively low economic status; that for infants of the oldest mothers was largely a reflection of high rates associated with later orders of birth and with relatively great economic pressure.

Interval since preceding birth.—The mortality rate was highest for infants born at short intervals after preceding births—the short interval representing a difference of only one year in their mothers' ages, measured in even years, at the successive births—and lowest for infants who followed preceding births at intervals of four years or more, as thus measured. This difference could not be explained by age of mother, order of birth, or economic factors, and was apparently due to factors, probably relating to the physical condition of the mother, that were associated with interval.

Interval before succeeding pregnancy.—In a small proportion of cases, those in which the mother became pregnant during the first year of life of the infant whose history was followed, the commencement of a subsequent pregnancy became a factor in the infant's chances of survival. Only 4.7 per cent of the total number of months lived by all the infants, however, were affected by this factor. The analysis showed that the influence exercised by the commencement of a subsequent pregnancy was due largely to the greater prevalence of artificial feeding among these infants; in many cases probably weaning was advised as soon as the subsequent pregnancy was known. The fact that a disproportionate number of these infants were born to mothers of nationalities and in families in which the father's earnings were low—groups for which the mortality rates were high—also tended to account for their higher mortality.

Type of birth.

Premature birth.—The mortality rate for premature infants was over six times as high as that for infants born at term. From causes peculiar to early infancy the greatest difference was found, the rate for the premature being 25 times that for other infants. The prematurely born had an excess mortality from every cause of death.

Among the factors that contributed to this high excess mortality among the premature were a disproportionate number of twins and triplets, a disproportionate number of male infants, and a disproportionate number of babies whose mothers died within one year. When allowance was made for the overweighting of this group with twins and triplets, with male infants, and with babies whose mothers died—groups with high death rates—the excess mortality among the premature was slightly reduced. Another factor was the greater prevalence of artificial feeding. Nevertheless, when the mortality among the prematurely born was compared with that among infants born at term who received the same type of feeding, the former was found to be greatly in excess of the latter.

The causes that produce or influence prematurity are referable largely to the health and condition of the mother. Prematurity was unusually prevalent among first births, among births to young mothers, among births following preceding births at short intervals, and among births to mothers who had been gainfully employed during pregnancy. The proportion of premature births was also high among twins and triplets and was higher for male than for female births.

Plural births.—Among the twins and triplets the mortality from all causes averaged about three and one-half times, from causes peculiar to early infancy it was nearly six times, from gastric and intestinal diseases nearly three times, and from respiratory diseases twice the corresponding rates for the single-born infants.

This excess mortality among twins and triplets was accounted for in part by a disproportionate number of prematurely born among them and in part by a greater prevalence of artificial feeding. But neither of these causes accounted for all this excess mortality, since both among full-term and premature and among breast-fed and artificially-fed infants the mortality of twins and triplets greatly exceeded that of single-born infants.

The chances of life of one of a pair of twins were found to be closely associated with those of the other, partly because twins are likely to be either both prematurely born or both born at term, partly because they are more likely to be of the same than of different sexes, partly because if one is weaned both are likely to be weaned, and for the rest, doubtless, because both twins are likely to have the same hereditary advantages and disadvantages and to be subject to the same favorable or unfavorable environmental conditions.

Type of delivery.—The mortality rate among infants whose mothers were delivered by means of instruments (120.3) was considerably higher than that among other infants (102.1). This difference was accounted for by a higher mortality from injuries at birth.

Type of feeding.

The mortality among the exclusively artificially fed averaged between three and four times that among the exclusively breast fed. The analysis indicated that early artificial feeding was especially harmful. The mortality among the artificially-fed relatively to that among the breast-fed infants was higher the longer the period of previous artificial feeding; in the first few months immediately following the beginning of early artificial feeding the mortality among

the artificially fed tended to increase relatively to that among the breast fed. The cumulative effect of type of feeding appeared quite as marked when certain groups which had high mortality rates and in which relatively large proportions of infants were artificially fed—the prematurely born, the twins and triplets, and the infants whose mothers died within one year—were excluded from the figures. When the transition from breast to partly breast or to artificial feeding was deferred until the eighth or ninth month it was accompanied not by increasing but rather by decreasing mortality rates.

The excess mortality among the exclusively artificially fed appeared from every cause of death but was most marked in case of gastric and intestinal diseases. The mortality from these diseases among the exclusively artificially fed was 7.7 times that among the exclusively breast fed; from causes peculiar to early infancy the mortality was 6.1 times, from epidemic and other communicable diseases 2.3 times, and from respiratory diseases 1.8 times the corresponding mortality among the breast fed. The high excess mortality from causes peculiar to early infancy is explained in part by the classification as due to "congenital debility" of deaths from such causes as "debility," "malnutrition," and "marasmus," which when they occur after the first month are often the result of faulty feeding. In part, however, it is the result of a tendency for infants who are physically weak to be artificially fed in larger numbers than other infants, a tendency which has been traced in the groups of prematurely born, of twins and triplets, and of infants whose mothers died within one year.

The excess mortality among the artificially fed was not due to any overweighting of the group with infants of nationalities for which the mortality rates were above average, nor was it due to any overweighting with infants of families in which the fathers' earnings were low.

Color[1] and nationality of mother.

The mortality rates for the several groups of infants classified according to color and nationality of their mothers were as follows: Jewish (lowest), 53.5; native white, 93.8; German, 103.1; Italian, 103.8; other foreign born, 129.6; colored,[1] 154.4; Polish, 157.2; French-Canadian, 171.3; and Portuguese (highest), 200.3. The greatest variations were found in the mortality from gastric and intestinal diseases, the highest rate from which was nearly ten times the lowest; but, except for one or two shifts in position, the nationalities ranked in the same order as when arranged according to their rates from all causes.

Variations in the proportions of premature births or in the proportions of twins and triplets were too slight to affect materially the relative position of the mortality rates for the several nationality groups.

Variations in the factors—order of birth, age of mother, interval since preceding birth, and interval before succeeding pregnancy—which together make up the influence of birth rate upon infant mortality were also relatively slight and did not suffice to explain the differences in the rates.

[1] Throughout this report the term colored is used to include not only Negroes but a small number of Chinese and Japanese. This is in accordance with the usage of the U. S. Bureau of the Census in its Birth Statistics and Mortality Statistics.

The most important differences between the nationality groups were found in the prevalence of breast and artificial feeding and in economic status. Each of these factors produced a marked influence upon the relative rank of the nationalities. The low rate for infants in the Jewish group was coincident with a high proportion of breast-fed infants and a very low proportion of artificially-fed infants; and the high rates for infants in the Portuguese and French-Canadian groups were attended by low proportions of breast-fed and high proportions of artificially-fed infants. On the other hand, the rate for the native white group was relatively low in spite of a large proportion of artificially fed, and that for the Polish group was relatively high in spite of a low proportion of artificially-fed infants. Differences in economic status helped to explain the favorable position of the native white and the unfavorable position of the Polish group. The high mortality among the colored as compared with that among the native white babies also appeared to be due largely to a comparatively low economic status. These two factors, it may be noted, tended partially to offset each other, with the result that after allowance was made for both factors together the relative rank of the different nationalities was not far from their relative rank before such allowance was made.

Housing congestion.

The infant death rate in families which lived in homes with two or more persons per room was two and one-half times that in families which lived in homes with less than one person per room. The variations in mortality from gastric and intestinal and from respiratory diseases were especially marked.

Though the group living in congested homes was overweighted with a slightly disproportionate number of infants of nationalities which had high death rates and of infants born in families in which the fathers' earnings were low, this overweighting was so slight that when its effect was eliminated the mortality among babies who lived in the more congested dwellings still appeared markedly above that prevailing among those who lived in the least congested homes.

Economic factors.

Employment of mother during pregnancy.—Nearly one-third of the mothers of live-born infants had been engaged in gainful labor either at home or away from home during pregnancy; slightly over half of these had worked at home and the rest—about one-eighth of the entire group—had worked away from home.

The mortality rate for infants whose mothers had worked away from home during pregnancy was 176.1, as compared with 114.6 for those whose mothers had worked at home and with 98 for those whose mothers had not been gainfully employed. An excess mortality among the infants whose mothers had worked away from home was found from each of the principal causes of death and appeared also in the neonatal mortality rate; the excess was especially great among the babies whose mothers had no intervals or only short intervals of rest from work before confinement. The proportion of premature births was also highest in the group of infants whose mothers were employed away from home. Work at home, on the other hand, was accompanied by a low rate of mortality from causes peculiar to early infancy, a low neonatal rate, and a low proportion of premature births, as

compared with the similar figures for the group of infants whose mothers did not work. It must be borne in mind, however, that the comparison is not between mothers who worked and mothers who enjoyed leisure but is rather between mothers who worked at home, chiefly keeping lodgers, and mothers who did housework. Furthermore, the group of mothers who were not employed included those who but for their poor physical condition would have been at work either at home or away from home, and consequently this group was somewhat unfavorably constituted as compared with the others.

The analysis showed that overweighting of the group of infants whose mothers were employed away from home with babies of nationalities which had high mortality rates and with babies born in families in which the fathers' earnings were low accounted for part of the high mortality shown by this group. But even after allowance was made for these factors the mortality among infants whose mothers were employed away from home was 40 per cent higher than that among infants whose mothers were not so employed.

Employment of mother during first year of infant's life.—Slightly over one-fourth of the mothers were employed during some part of the infant's first year of life, more than seven-tenths of them at home and less than one-third (or one-twelfth of the entire number) away from home. Nevertheless, of the months lived to the end of their first year by all the infants included in the study, only 4.5 per cent were lived by babies after their mothers had begun work away from home.

The mortality from all causes among infants whose mothers worked away from home was two and one-half times, that from gastric and intestinal diseases was over three times, and that from respiratory diseases was twice the average rates prevailing at the corresponding ages; among infants whose mothers worked at home average rates of mortality prevailed.

The excess mortality among infants whose mothers were employed away from home was due in part to an unusual prevalence of artificial feeding, but even after allowance was made for the larger proportion of artificially fed the mortality among these infants was still twice the average. Other factors that contributed to the high rate for infants whose mothers were employed away from home was the disproportionate number of babies of nationalities which had high rates and of babies in families in which the fathers' earnings were low. When allowance was made for the former, the rate for the group employed away from home was still 1.7 times the average, and when allowance was made for the latter, 1.6 times the average. There still remained an excess mortality, due probably to lack of the care which only mothers who remained at home could give their babies.

Earnings of father.—The infant mortality rates from all causes and from each principal cause of death were highest when the father's earnings were low and lowest when the father's earnings were relatively high. When allowance was made for variations in the size of the family the same close correspondence was found between the infant mortality rate and economic pressure as measured by per capita income from father's earnings. In general, the father's earnings constituted the main source of income of these families, and the infant mortality rates were lower, family incomes being equal,

when these incomes were derived wholly from the father's earnings than when additional funds were derived from the earnings of the mother or of the older children.

After allowance was made for variations in order of birth, age of mother, and interval between births, the high correlation between infant mortality and father's earnings was still nearly as marked as before; it could not, therefore, be attributed to association with unusual frequency of births. Nor could it be explained by differences in the prevalence of artificial feeding, for a slightly larger proportion of infants in the higher than of those in the lower earnings groups were artificially fed. Furthermore, it could not be explained by overweighting of the low-earnings groups with disproportionate numbers of infants of nationalities which had high rates, for the analysis indicated rather that the high rates in certain of the nationalities were to be ascribed to low economic status; the same marked decrease in infant mortality as father's earnings increased was found in each of the principal color and nationality groups. Nor do other economic factors—housing congestion, employment of mother during pregnancy, and employment of mother during the infant's first year—account for all the relationship between low earnings of father and infant mortality, though they are responsible for it in part. The analysis indicated that low earnings of father exerted a potent influence over the prevalence of these factors and therefore must be regarded as primarily responsible for the greater mortality associated with them. The presence of intermediate factors in the chain of causation does not lessen the responsibility of low earnings as a primary cause. The intermediate factors in the chain of causation linking father's earnings and infant mortality included, besides those already mentioned, adequate care of the mother during pregnancy and confinement and the care of the infant's health during his first year. A close association was found to obtain between these factors and the father's earnings.

BASIC MATERIAL AND METHODS OF ANALYSIS

BASIS OF STUDY

This study is based upon detailed information regarding 22,967 live births and 813 stillbirths [1] which occurred in selected years between 1911 and 1916 in eight American cities. The cities and years were Johnstown, Pa. (January 1 to December 31, 1911), Manchester, N. H. (November 1, 1912, to October 31, 1913), Brockton, Mass. (November 1, 1912, to October 31, 1913), Saginaw, Mich. (December 1, 1912, to November 30, 1913), New Bedford, Mass. (January 1 to December 31, 1913), Waterbury, Conn. (June 1, 1913, to May 31, 1914), Akron, Ohio (July 1, 1912, to June 30, 1914), and Baltimore, Md. (January 1 to December 31, 1915).

The data secured in regard to each infant included not only facts available from birth and death certificates—such as sex, whether single or plural birth, number in order of birth, attendant at birth, month of birth, age at death, cause of death, legitimacy, race and country of birth of mother, and age of mother—but information on other points intimately connected with the infant's chances of life, including type of feeding during each month of the first year of life, period of gestation, mother's employment during pregnancy and during the infant's first year of life, father's earnings and occupation, and housing conditions. Facts relating to the mothers' whole maternity histories were obtained, from which the interval between births could be derived; and in one city, Baltimore, details in regard to the prenatal, confinement, and postnatal care received by the mothers were sought. In the course of these studies, therefore, a considerable mass of data has been accumulated covering many points upon which hitherto much-needed information has been almost entirely wanting.

The results of the studies of infant mortality in each of these cities have already been published separately, together with information relating to the conditions peculiar to each city.[2] But in these preliminary studies, with the exception of the one relating to Baltimore, the number of births was too small to justify elaborate analysis. The accumulation of evidence from all these cities, including the evidence available for the large number of births in Baltimore, makes possible the more detailed study of causal influences presented in this report.

LIMITATIONS OF MATERIAL

The data here analyzed are subject to certain limitations which must be borne in mind in considering the conclusions drawn.

Since all the births and deaths included occurred in cities, influences associated with rural as distinguished from those associated with

[1] Stillbirths are discussed in detail in Appendix A, pp. 167–173.

[2] See reports on investigations of infant mortality in Johnstown, Manchester, Waterbury, Brockton, Saginaw, New Bedford, Akron, and Baltimore (U. S. Children's Bureau Publications Nos. 9, 20, 29, 37, 52, 68, 72, and 119, respectively).

urban conditions could not be included in the discussion. In considering the general applicability of the conclusions, therefore, it must be remembered that they are based upon data limited to urban areas.

On account of the unusual difficulties encountered in securing information in regard to illegitimate births, not to mention the fact that data relating to such births require special analysis, this study is restricted to legitimate births.[3]

On some points even the number of births available for the present study proved too small to afford perfectly satisfactory answers to the questions raised. In these cases, which will be noted in the detailed discussion of each topic, the answer which the information available does afford is presented as indicating the conclusion which would probably be more fully substantiated by the addition of more data.

In other cases, though the number of births is sufficient to afford definite conclusions in regard to certain important problems, other questions are raised in the progress of the inquiry to answer which data are insufficient or entirely wanting. Some of these deficiencies or gaps in the data available were appreciated more and more fully as the field studies progressed, and as a result the later studies included questions on a number of points which in the earlier ones had been omitted or had not been covered adequately. In a few cases changes were made in the form of the inquiry or in the details of tabulation. On these points, as a consequence, the evidence is not available in exactly comparable form for all the eight cities, and the discussion is therefore limited to the group of cities for which the data are comparable. On some points information is available for only a single city. These variations in the data will be pointed out during the progress of the discussion.

Finally, on some important points information is entirely lacking. In a few cases questions were framed to cover definite aspects of the relation between a certain factor and infant mortality, but in the course of the analysis deficiencies in the material became apparent that precluded a satisfactory treatment of the subject. In other cases it was not feasible to secure the desired data by the means available or, as in case of evidence relating to the physical condition of the mothers during pregnancy, it was impossible at the time the studies were made to secure full information. In the following discussion, therefore, many questions are raised that still remain to be studied.

METHODS OF FIELD STUDIES

The methods followed in securing the data have been described in detail in the reports already issued for each city studied. They included copying the birth records for the selected year, consulting the death records to ascertain how many of the infants born in the selected year had died under 1 year of age, and visiting the mothers to ascertain other facts in regard to the infants and their environment during their first year of life or such part of it as they lived.

Difficulties inherent in the procedure of locating mothers and securing information led to the exclusion of certain cases from the

[3] For an analysis of conditions surrounding illegitimate births, see Infant Mortality: Results of a Field Study in Baltimore, Md., Based on Births in One Year, by Anna Rochester, pp. 155–176 (U. S. Children's Bureau Publication No. 119).

studies; these exclusions, the reasons for them, and their possible influence upon the mortality rate found for the infants studied as distinguished from that for all the infants in the city are also fully described in the several reports.[4] Five main groups of infants were excluded: (1) Illegitimate infants, since as a group they were especially difficult to locate and information in regard to them was not always obtainable; (2) infants born to nonresident mothers, who for the most part came to the city hospitals to take advantage of the superior facilities for hospital care during confinement and returned to their homes outside the city shortly afterwards; (3) infants whose mothers were known to have moved away from the city before the visit of the agent—cases in which it was not feasible to arrange interviews with the mothers; (4) infants whose families had moved from the addresses given on the birth or death certificates and could not be traced; and (5) infants for whom the necessary data could not be secured. In short, the excluded cases, though falling into well-defined groups, were all cases for which detailed information could not easily be obtained from the mothers. Except for the illegitimate births, the mortality rate for the infants of the excluded groups was probably not far different from that for the infants included in the study.

Most of the cities selected for these studies were within the United States provisional birth-registration area and therefore had fairly complete registers of births which could be used as the basis of the study. In two or three cities additional births were located by means of a canvass, a neighborhood inquiry, or searches through the baptismal records of the churches, or by other means. In Akron, a city which at the time of the study was not in the birth-registration area, a house-to-house canvass of the entire city was made in order to complete the list of births. Details of the methods employed to supplement the original lists of registered births and of the results obtained are given in the separate reports dealing with each city.[5]

METHODS OF ANALYSIS

The infant mortality rates in these studies were arrived at by comparing with the number of infants born in a selected year the number of deaths under 1 year of age that occurred among these infants. These rates are, therefore, independent of changes in the birth rate that sometimes affect materially infant mortality rates calculated by the usual method; that is, by dividing the deaths under 1 year of age that occur in a given calendar year by the births that occur in the same year. Because of this fact they are true infant mortality rates; for the purposes of this study, furthermore, the method followed was the only one feasible for obtaining accurate rates for the different groups into which the data were to be analyzed.

In consequence of the difference between this method of calculating the rates and that in common use, as well as the policy of exclusions, the rates arrived at in these studies for the several cities are not strictly comparable with those computed by the ordinary methods for the same cities; but since the primary object of this study is to

[4] See also "Infant-mortality studies of the Children's Bureau," by Robert M. Woodbury, in Quarterly Publications of the American Statistical Association, Vol. XVI, pp. 30–53.

[5] For a summary statement of these methods and results, together with an analysis of the rates of infant mortality in the various excluded groups, see Appendix B, pp. 174–183.

ompare the mortality rates for various groups of infants included n it, the comparability of the rates with those as ordinarily computed s of minor importance.

The mortality rates used in the present study are of two types: Those comparing the deaths under 1 year of age within a group with he births in the same group, thus expressing the probability of lying within the first year of life for the infants in the group, and hose comparing the deaths that occurred in a group within a given nonth with the number of infants in the group living at the beginning of that month, thus expressing the probability of dying within he given month for the infants in the group. The first method s used whenever the basis of classification is a characteristic of the irths, such as order of birth, prematurity, or age of mother at the ime of the birth. The second is used whenever the basis of classification is a condition subject to change during the first year of life, uch as type of feeding, mother's employment, or a succeeding pregnancy of the mother. Since death rates are fundamentally a comparison of deaths with the time lived—the deaths in the time interval eing compared to the total number of the time units lived by infants xposed to the risk of death [6]—it follows that in these cases for which he basis of classification changes the use of the relatively large unit f time of one year will not yield a true rate. In the case of the mployment of the mother during the infant's first year of life, for xample, the death of an infant before the mother went to work can ot be attributed to any effect of the mother's employment, and to lassify infants simply according to whether or not their mothers orked at any time in the year will not yield a denominator that xpresses fairly the time lived by the two groups of infants. In order o obtain accurate results for the relative mortality in such cases, t is necessary to diminish the unit of time; one month is the most onvenient unit and is short enough so that changes in the infant's tatus occurring within it do not materially affect either the numerator the deaths) or the denominator (the time lived) of the fraction expressing the rate of mortality.

Where two or more causal factors combined to produce a given esult the influence of each was isolated, so far as the data at hand ermitted, by the Westergaard method of expected deaths.[7] The lan of treatment is to consider each factor and separate its influence rom that of other associated factors so that finally a fairly definite tatement can be made in regard to whether the factor under consideration has any independent influence upon infant mortality, and, f so, in regard to the nature and extent of this influence. A question aised in connection with certain factors is the extent of their influence ver other more immediate causes of infant mortality; in these cases n effort is made to throw light upon the chain of causation that links he factor under consideration to the infant mortality rate.

In considering the various causes of infant mortality the subject f the immediate or pathological cause of death is first taken up.

[6] The "probability of dying," p, is connected with the death rate, r, by the formula $p=\frac{r}{1+\frac{r}{2}}$; the use of he former mode of expressing the rate does not lessen the applicability of the principle stated.

[7] For a brief explanation of this method and its application to the problems of infant mortality see Appendix C, p. 184. See also "Westergaard's method of expected deaths as applied to the study of infant mortality," by Robert M. Woodbury, in Quarterly Publications of the American Statistical Association, ol. XVIII, pp. 366-376.

This study suggests underlying physical, social, economic, and other factors, and the causal influence of each of these is discussed separately in the succeeding sections of the report.

Age, which has an intimate connection with the incidence of mortality, is considered next. A classification by age defines the period of greatest influence of the various pathological causes of death and is fundamental to any study of the more complex factors such as type of feeding.

Seasonal conditions as affecting the chances of life of infants born in different months of the year are next discussed. No attempt is made to study the influence of variations in weather and temperature conditions for the different cities. Since in each city the births for a single year were considered, the analysis on this point is limited to the influence of variations in the temperatures and weather conditions of the different months of that year.

TABLE 1.—*Causes of death under 1 year of age; infants in eight cities*

Detailed International List Number	Cause of death	Infant mortality rates	Infant deaths	
			Number	Per cent distribution
	All causes	111.2	2,555	100.0
	Gastric and intestinal diseases	32.4	743	29.1
102, 103	Diseases of the stomach	1.0	24	.9
104	Diarrhœa and enteritis	31.3	719	28.1
	Respiratory diseases	19.6	450	17.6
89	Acute bronchitis	3.0	70	2.7
91	Broncho-pneumonia	11.6	267	10.5
92	Pneumonia	4.9	113	4.4
150	Malformations	4.3	99	3.9
	Early infancy	36.1	830	32.5
151(1)	Premature birth	17.4	399	15.6
151(2), 152(2), 153	Congenital debility	14.9	343	13.4
152(1)	Injuries at birth	3.8	88	3.4
	Epidemic and other communicable diseases	7.1	162	6.3
6	Measles	.5	12	.5
7	Scarlet fever		1	(1)
8	Whooping cough	2.2	51	2.0
9	Diphtheria and croup	.4	9	.4
10	Influenza	.4	10	.4
14	Dysentery	.2	5	.2
18	Erysipelas	.5	12	.5
24	Tetanus		1	
28, 29	Tuberculosis of the lungs	.5	12	.5
30	Tuberculous meningitis	1.0	23	.9
31, 32, 33, 34, 35	Other forms of tuberculosis	.1	3	.1
37	Syphilis	1.0	23	.9
155 to 186	External causes	.6	14	.5
187, 188, 189	Diseases ill defined and unknown	2.5	58	2.3
	All other causes	8.7	199	7.8
61	Meningitis	1.4	33	1.3
71	Convulsions	2.0	45	1.8
79	Organic diseases of the heart	.4	9	.4
	Other	4.9	112	4.4

[1] Not shown when less than one-tenth of 1 per cent.

The influence of sex in the causation of infant mortality is treated in a separate section.

The remaining factors are treated in six groups. The first group comprises those associated with the health and condition of the mother during pregnancy and at confinement—points on which the information available in the present study is relatively meager. This group includes the condition of the mother's health as indicated

y her death in or survival at the end of the year following the child's irth, evidence of ill health during pregnancy, and whether or not he had any medical prenatal care. The mother's age, which may e regarded as indicative of her physical maturity or immaturity and f other physical conditions, is discussed in connection with the second roup, which includes those factors directly associated with birth fre- uency: Order of birth, interval since the last birth, and interval, if ess than one year, before the commencement of the next pregnancy. he third group comprises factors associated with birth or confinement, ncluding prematurity, single or plural birth, and type of delivery. A ourth group is concerned with the various types of feeding. The fifth omprises the factors connected with the nationality of the mother, ncluding racial characteristics as to innate vitality or lack of vi- ality and national customs and traditions in regard to feeding, are at confinement, infant clothing, etc. The sixth and final roup is composed of social and economic factors, including the nother's employment or nonemployment during the period of regnancy and during the first year of the infant's life, housing con- estion, and economic status as indicated by the father's earnings nd by the per capita income available for the family during the ritical period of the infant's first year.

Since the infant mortality rate is subject to the influence of many nportant factors, the difficulty of isolating the influence of a single actor is great. In certain cases the analysis by cause of death implifies to some extent the problem of tracing the effect of the articular factor under consideration. For example, the influence f the mother's employment during pregnancy would be expected o appear largely in deaths during the first month of life or in deaths om causes peculiar to early infancy; on the other hand, the in- uence of the mother's employment during the first year of the infant's fe would not affect appreciably either of these groups of deaths, nce most of them would have occurred before the mother went o work. But, in general, the importance of isolating the influence f one factor from that of an associated factor depends on how close ne association is and how important the associated factor itself is s a cause of infant mortality. The greater the effect of an asso- iated factor the more important it is to eliminate its influence from nat of the factor under consideration; and the closer the association ne more essential it is to determine whether the effect ascribed to a iven factor is due indirectly to the associated factor. On the other and, if either the effect of the associated factor is slight or the ariations in its prevalence are small, the elimination of its influence s of minor importance. In this study of causes, therefore, the rocedure of isolating the influence of each causal factor is restricted, s it must necessarily be with so complex a subject, to the most nportant and significant of the associated factors.[8]

[8] For a fuller discussion of the method of analysis see Appendix C, p. 184.

PATHOLOGICAL CAUSES OF DEATH

Of the 22,967 live-born infants included in the present study 2,555 died before they were 1 year of age, giving an infant mortality rate of 111.2.

The causes of death as reported by the physicians who signed the death certificates are shown in Table 2 classified according to the International List of Causes of Death.[1] In interpreting the results of this classification it should be borne in mind that their significance depends upon the accuracy of the original reports of cause made by the physicians in attendance. The fact that the deaths all occurred in cities located in States within the death-registration area suggests that the accuracy of the original returns was probably above the average for such certification of causes.

The great majority of the deaths fell under the three principal groups of causes of infant mortality—causes peculiar to early infancy, gastric and intestinal diseases, and respiratory diseases. The deaths classified as due to these causes constituted 79.2 per cent, or nearly four-fifths, of the whole number. Epidemic and other communicable diseases accounted for a considerable proportion of the remainder. Each of these groups will be discussed in detail.

CAUSES PECULIAR TO EARLY INFANCY

The most important group, judging from the proportion of deaths ascribed to it in the present study, was that of causes peculiar to early infancy, which comprise premature birth, congenital debility, and injuries at birth. Together these causes accounted for nearly one-third of all the infant deaths.

The proportion of deaths ascribed to causes peculiar to early infancy depends, however, not only upon the mortality rate from these causes but also upon the mortality rates from all other causes. This proportion, therefore, while it indicates the relative contribution of these causes to the total quota of deaths, is not especially significant for comparing mortality from these causes among the infants included in the present study with that among other infants, nor even for analyzing the relative mortalities within the several classifications into which the data are subdivided. Even though the rates from causes peculiar to early infancy were identical in two groups to be compared, yet the relative proportion of the infant deaths due to this group of causes would be greater the smaller the number of deaths, or in other words, the lower the mortality rates, from other causes. For purposes of comparison, therefore, it is essential to employ specific infant mortality rates, or deaths from the specific causes per 1,000 live births.

[1] In classifying causes which were not stated in the exact terms used in the headings of the table, the practice of the U. S. Bureau of the Census as given in the Manual of the International List of Causes of Death and the Index of Joint Causes of Death was followed.

TABLE 2.—*Comparative infant mortality rates, by cause of death, in eight cities studied by the Children's Bureau, in cities in the United States birth-registration area, 1915, and in New Zealand, 1915*

Cause of death	Infant mortality rates		
	Eight American cities	Cities in United States birth-registration area, 1915	New Zealand, 1915
All causes	111.2	103.3	50.1
Gastric and intestinal diseases	32.4	26.6	4.9
Respiratory diseases	19.6	17.8	4.6
Malformations	4.3	6.2	4.7
Early infancy	36.1	35.0	24.9
Epidemic and other communicable diseases	7.1	8.5	3.2
External causes	.6	1.0	.7
Diseases ill defined and unknown	2.5	.3	.3
Other causes	8.7	8.0	6.7

The mortality rate from causes peculiar to early infancy was 36.1 and was composed of rates of 17.4 from premature birth, 14.9 from congenital debility, and 3.8 from injuries at birth. As compared with similar rates for the cities [2] of the United States birth-registration area in 1915 (the earliest year for which such figures are available) the rate in the eight cities was slightly higher—36.1 as compared with 35. The excess appears only in the rate for congenital debility—which was 14.9 as compared with 11.8. On the other hand, the rate from premature birth in the eight cities was lower than that in the cities of the birth-registration area of 1915—17.4 as compared with 18.7. The rate from injuries at birth was likewise lower—3.8 as compared with 4.5. As compared with the 1915 rate from causes peculiar to early infancy in New Zealand, including both cities and rural areas—the detailed data not being available for the cities only—the rate from these causes in the eight cities was almost one and one-half times as high.

The analysis of the mortality from these causes among the several groups of infants included in the study revealed marked differences, which will be taken up in detail in later sections. In passing mention may be made of the great difference between the rate for infants of Jewish mothers (22.7) and that for infants of French-Canadian mothers (44.7) (p. 104). Differences arising from or associated with employment of the mother during pregnancy, economic status of the family, race and nationality of the mother, and condition of the mother during pregnancy and confinement, so far as the facts available in this study throw light upon it, as well as those arising from or associated with conditions peculiar to the child—whether male or female, whether twin or triplet or of a single birth—all these differences must be studied if the influences that produce the mortality from causes peculiar to early infancy are to be traced.

To a large extent these causes have their origin in the condition and care of the mother during pregnancy and confinement. This is true especially of deaths from injuries at birth, many of which can

[2] Including only cities having in 1910 a population of 10,000 and over.

be prevented by skilled care. Mortality from premature birth depends in very large part upon the mother's condition, though in part, as will be shown later (p. 73), they depend upon whether the births are single or plural. Death from "congenital debility," on the other hand, is in some cases to be ascribed to improper feeding rather than to prenatal or natal causes, since, in accordance with the rules for classification followed by the United States Bureau of the Census, deaths under 1 year of age from causes stated in such vague terms as "marasmus" (wasting), "emaciation," "malnutrition," "debility"—terms which might be used to describe a condition resulting from improper feeding—are classed with deaths from congenital debility (pp. 95–96). But with this possible exception the causes peculiar to early infancy are almost entirely natal and prenatal in origin.

GASTRIC AND INTESTINAL DISEASES

Gastric and intestinal diseases, comprising the diseases of the stomach and diarrhea and enteritis, were second in importance as causes of death. This group accounted for nearly three-tenths of all the deaths. Of the diseases included diarrhea and enteritis were by far the most important, accounting in fact for nearly all the deaths from this group of causes.

The infant mortality rate from gastric and intestinal diseases was 32.4: From diseases of the stomach, 1, and from diarrhea and enteritis, 31.3.[3] The rate from these diseases in the eight cities was considerably above that in the cities of the birth-registration area in 1915 (26.6); the difference appeared wholly in the mortality from diarrhea and enteritis. The rate from these causes in the eight cities was over six times as high as the New Zealand rate in 1915 (4.9).

Even more marked differences in mortality from gastric and intestinal diseases were found between many groups of births in the eight cities studied—for example, the difference between the rate of 101.6 for infants of Portuguese mothers and that of 10.5 for infants of Jewish mothers (p. 104). Similar contrasts were shown between various groups into which the births were classified according to economic status, mother's employment, and other factors (pp. 125, 132, 141, 148). The difference was especially marked between the mortality from these causes among breast-fed infants and that among artificially-fed infants (pp. 94–96).

These deaths are due largely, in fact, to improper feeding. Not only the prevalence of artificial feeding itself but also the prevalence of carelessness in using artificial food and of ignorance as to precautions necessary in connection with it vary with nationality traditions, with economic status, and with the employment of the mother. These points and others that relate to mortality from gastric and intestinal diseases will be discussed in connection with the analyses of several factors in succeeding sections of this report.

A markedly high incidence of mortality from gastric and intestinal diseases during the summer months is shown in Chart I, which gives the distribution of deaths from these diseases by seasons. The

[3] Each rate is calculated to the nearest tenth; it sometimes happens, therefore, that the sum of the rates for two or more groups does not exactly equal the rate for the group into which they are combined.

high temperatures of the summer months appear to have had a decided influence, since three-fourths of all these deaths occurred in the period from July to October (pp. 26, 237). Evidently, therefore, climatic and weather conditions were an important underlying cause of mortality from gastric and intestinal diseases.

RESPIRATORY DISEASES

The third most important group of causes of death was that of respiratory diseases, comprising acute bronchitis, broncho-pneumonia, and pneumonia. To these causes were ascribed over one-sixth (17.6 per cent) of the deaths under 1 year of age.

The infant mortality rate from respiratory diseases was 19.6, which was composed of rates of 3 from acute bronchitis, 11.6 from broncho-pneumonia, and 4.9 from pneumonia. These figures were slightly above those for the cities in the birth-registration area in 1915, which were 2.7, 11.1, and 4, respectively. The mortality from respiratory diseases in the eight cities was over four times as high as the rate for New Zealand in 1915.

The influence of climatic and weather conditions is shown in the higher incidence of these diseases during the winter and early spring.

Marked differences were found in the rates for the different race and nationality groups, which varied from 8.9 for infants of Jewish mothers to 50.8 for those of Portuguese mothers (p. 104). Differences in the mortality from these causes which appeared among different groups in other classifications of the infants in the eight cities will be discussed in detail in later sections of the report.

EPIDEMIC AND OTHER COMMUNICABLE DISEASES

A subordinate, though important, group, that of epidemic and other communicable diseases, comprises the principal epidemic diseases and also tetanus, syphilis, and tuberculosis in its various forms. This group accounted for about 6 per cent of all the deaths under 1 year of age in the eight cities.

The infant mortality rate from epidemic and other communicable diseases was 7.1. Of the individual causes whooping cough took the largest toll, with a rate of 2.2; tuberculosis ranked second with a rate of 1.5; and syphilis was third with a rate of 1. Other diseases responsible for deaths were measles, erysipelas, diphtheria, influenza, dysentery, and scarlet fever.

From this entire group of causes the mortality rate in the eight cities was slightly lower than that in the cities of the birth-registration area in 1915—7.1 as compared with 8.5. From whooping cough the mortality was higher in the eight cities, but from influenza and dysentery it was substantially identical, while from all other causes it was lower than in the cities of the birth-registration area. The mortality from epidemic and other communicable diseases in New Zealand in 1915 was less than half that of the eight cities.

Marked differences are to be noted between the rates for the several nationality and race groups. Thus the rate of 14.9 for infants of Portuguese mothers was over three and one-half times that for infants of Polish mothers, 3.9 (p. 104).

Significant differences were also found between the rates for breast-fed and artificially-fed infants, for the different groups in a classification based on the earnings of the fathers, and for various other groups into which the infants were classified. Such differences will be discussed in the sections dealing with these factors.

The epidemic and other communicable diseases are of course due to specific infections. Variations in the prevalence of mortality from these diseases depend in part, therefore, upon differences in the degree to which infants in the several groups are exposed to infection and in part upon differences in the innate or developed resistance to these infections among the infants included in such groups. Hereditary susceptibility has been suggested as a possible factor in tuberculosis. In cases of syphilis during infancy the infection has usually been transmitted through the mother to the infant before birth. Tetanus as a cause of infant mortality is an infection usually associated with lack of cleanliness at confinement.

The influence of age upon exposure and resistance to epidemic and other communicable diseases is of special importance. In case of diphtheria, for example, infants who are breast fed have a period of immunity that lasts about six months; the incidence of this disease increases from about the sixth month in case of breast-fed infants until a maximum mortality is reached in the second or third year of life. The incidence of whooping cough increases from birth until a maximum is reached and then gradually diminishes, the heaviest mortality from this disease occurring in the first year. The incidence of measles increases from birth until a maximum is reached late in the first or even in the second year. The resistance of the infant to infection with most of the other diseases, including tuberculosis, for some reason decreases during the months immediately following birth and then gradually increases. As a consequence, among the infants included in this study very few deaths from these diseases occurred in the first month or two after birth. (See General Table 1, p. 186, and pp. 23–25.)

MALFORMATIONS

The deaths from malformations comprised only 3.9 per cent of the total number of deaths under 1 year of age. The mortality from these causes was 4.3 per 1,000 births. Although comparatively little is known in regard to the specific causes of congenital malformations, these deaths, like those from causes peculiar to early infancy, have their origin in prenatal conditions. The rate from malformations in the eight cities was lower than that in the cities of the birth-registration area or than that in New Zealand in 1915.

OTHER CAUSES

All other causes, comprising principally meningitis, organic diseases of the heart, convulsions, and ill-defined diseases, accounted for one-tenth of all the infant deaths. The mortality rate from these causes was 11.2, which was composed of rates of 2.5 from ill-defined and unknown diseases, 2 from convulsions, 1.4 from meningitis, 0.4 from organic diseases of the heart, and 4.9 from a miscellaneous group of other diseases. The corresponding rates for the cities of the birth-registration area in 1915, with the exception of

that for "other diseases," were lower: From ill-defined and unknown diseases, 0.3; from convulsions, 1.2; from meningitis, 0.8; and from organic diseases of the heart, 0.3. The New Zealand rate in the same year from ill-defined and unknown diseases and that from all other causes were markedly below the corresponding rates for the eight cities.

The high mortality from ill-defined or unknown diseases means that rates from other causes, or at least from certain of them, are understated, since if the true causes of these deaths from ill-defined or unknown diseases were known the deaths would be properly assigned. Hence a comparison of the rates from definite causes in the eight cities with those in the cities of the birth-registration area or with those in New Zealand is slightly more favorable to the eight cities than it would be if the assignment of causes of death had been as accurate in them as in the other areas.

This is true also of mortality attributed to convulsions, since convulsions are a symptom rather than a disease. A more accurate return of the causes of deaths ascribed to convulsions would result in an increase in the number of deaths and in the death rates charged to the diseases actually responsible.

SIGNIFICANCE OF COMPARISONS WITH RATES IN BIRTH-REGISTRATION CITIES AND IN NEW ZEALAND

In the preceding discussion the rates of mortality from the several causes for the eight cities have been compared with those for New Zealand and for the cities in the birth-registration area of the United States in 1915. This comparison gives an idea whether the mortality in the eight cities was relatively high or low and reveals that it was not only markedly in excess of that attained in the country with the lowest infant death rate in the world but also considerably in excess of that in the birth-registration cities of the United States.

The relatively high rates in the eight cities, especially as compared with those from the same causes in New Zealand, suggest that a large proportion of the deaths in the eight cities were preventable. The influence of various conditions upon the infant mortality rate is, therefore, an important subject of inquiry, which will be taken up in succeeding sections as far as is permitted by the data available for analysis.

The fact that rates in the eight cities studied were higher than those in the cities of the birth-registration area is doubtless to be accounted for chiefly by the special characteristics of the cities selected for study. Each of these cities was selected because it possessed in marked degree some industrial characteristic that would serve to bring out contrasts in conditions which might affect infant mortality. Thus Johnstown is a city in which the manufacture of steel is the principal industry; Manchester is dominated by its textile factories; Brockton is a shoe-manufacturing center; Akron is prominent in the manufacture of rubber goods; and Saginaw, New Bedford, and Baltimore are cities with diversified industries. Most of these cities, furthermore, have very considerable proportions of foreign-born inhabitants, and Baltimore has a very considerable proportion of negroes. These characteristics of the eight cities selected

for special study probably go far to explain their relatively high infant mortality rates as compared with those of the birth-registration cities.

The chief interest of the present analysis of infant mortality in the eight cities, as already suggested, lies in a comparison of the death rates for the various groups classified according to special conditions of birth or of environment during life and in a search for explanations of the differences found which will throw light upon possibilities of prevention. The full data available for each of the births included permit detailed analysis of the causal factors operating to produce differences in mortality.

AGE OF INFANT

Mortality among infants under 1 year, it is well known, varies markedly according to the month of age. The rates for the babies included in this study were highest immediately after birth, dropped rapidly during the first two weeks, and continued to fall, though at a constantly diminishing rate of decrease, throughout the year. If the mortality which prevailed during the first two weeks had continued throughout the year, nearly all the infants would have died before the end of the year. Even if the mortality which prevailed during the first month had continued, more than half the infants would have died. Table 3 shows the rates prevailing during each month of life calculated both upon a monthly and upon a yearly basis, the latter being 12 times the former. In subsequent discussions monthly rates [1] are used wherever the data are classified by months of life.

When deaths from the different causes are considered separately, as in Table 4, the variations in the rates by age are found to be different for the several causes. Most of the deaths from malformations occurred during the first month. The rate from causes peculiar to early infancy was 30.3 in the first month but fell abruptly to 2.3 in the second and to a negligible figure in later months. When the mortality from causes peculiar to early infancy was analyzed, it appeared that the deaths from injuries at birth occurred almost without exception in the first month and that of those from premature birth more than eleven-twelfths took place during the first month. On the other hand, over one-third of the deaths from congenital debility occurred after the first month. Further analysis showed that a large proportion of these infants who died after the first month had been artificially fed, which suggests that in these cases wrong feeding may have had more to do with causing death than innate physical weakness or lack of vitality (pp. 95–96).

TABLE 3.—*Infant mortality rates, by month of life; live births in eight cities*

Month of life	Monthly mortality rates	Annual mortality rates [1]	Month of life	Monthly mortality rates	Annual mortality rates [1]
First	44.8	538	Seventh	6.3	76
Second	9.3	112	Eighth	5.8	70
Third	8.1	97	Ninth	5.7	68
Fourth	8.0	96	Tenth	5.3	64
Fifth	7.7	92	Eleventh	3.9	47
Sixth	7.4	89	Twelfth	4.5	54

[1] If rates for each month continued for 12 months.

Besides malformations and causes peculiar to early infancy, which in most cases probably had their origin in the prenatal period or at birth, respiratory diseases appeared to claim a somewhat larger

[1] Monthly mortality rates are computed by dividing the deaths in a given month by the number of infants surviving at the beginning of the month and expressing the result in terms of deaths per 1,000 infants.

proportion of victims in the first month or two than at any later period. From respiratory diseases the rate was 2.9 in the first month and 2.1 in the second; a tendency to fall was indicated by the rate of 1.2 in the eleventh and twelfth months.

On the other hand, the mortality from gastric and intestinal diseases showed a tendency to increase during the early months of life. The rate was 3 in the first month and 2.9 in the second; from this point it rose until a maximum of 3.8 was reached in the sixth month, after which it gradually decreased to 1.7 and 1.8 in the eleventh and twelfth months, respectively.

TABLE 4.—*Monthly death rates, by cause of death and month of life; infants in eight cities* [1]

Month of life	Monthly death rates from specified causes						
	All causes	Gastric and intestinal diseases	Respiratory diseases	Malformations	Early infancy	Epidemic and other communicable diseases	Other causes
First	44.8	3.0	2.9	3.3	30.3	1.0	4.2
Second	9.3	2.9	2.1	.1	2.3	.8	1.2
Third	8.1	3.7	1.7	.3	.8	.6	.9
Fourth	8.0	3.5	2.1	.2	.8	.6	.8
Fifth	7.7	3.7	1.5	----	.6	.5	1.3
Sixth	7.4	3.8	1.6	.2	.7	.3	.8
Seventh	6.3	3.4	1.6	----	.3	.3	.7
Eighth	5.8	2.4	2.0	----	.2	.7	.4
Ninth	5.7	2.3	1.7	----	.1	.8	.7
Tenth	5.3	2.6	1.4	.1	----	.6	.5
Eleventh	3.9	1.7	1.2	----	----	.5	.4
Twelfth	4.5	1.8	1.2	----	.2	.8	.5

[1] For basic figures see General Table 2, p. 187.

In interpreting this increase in gastric and intestinal diseases during the first few months the question might be raised whether it was due to an increase in the proportion of infants who were artificially fed (a group in which the rate from gastric and intestinal diseases was especially high) or whether it occurred irrespective of any change in feeding. This question can be answered by a study of the mortality from gastric and intestinal diseases among the breast-fed and the artificially-fed infants from month to month during the early part of the first year of life. (See General Table 67, p. 212.) For the breast-fed infants the maximum rate of 2.1 was found in the first month; the rate fell rapidly, to 1.3 in the second, 1. 2 in the third, 0.7 in the fourth, 0.8 in the fifth, 0.6 in the sixth, and 0.3 in the seventh month. During this period the groups studied included from 19,000 to 8,000 breast-fed infants. In the months after the seventh the rates showed a tendency to increase, reaching 1.2 in the eleventh month; but in these later months the number of breast-fed infants in the groups studied fell off rapidly to less than 3,000 in the twelfth month. For the artificially-fed infants, on the other hand, the maximum mortality was not reached until the third month, the rate rising from 8.3 in the first to 11.1 in the third, and in each month from the second to the seventh the rate was higher than in the first. After the seventh month, when the rate was 8.9, it fell off rapidly to 2.8 in the twelfth. The increase in mortality from gastric and intestinal diseases that appeared up to the sixth month was due, then, in part

to the transfer of infants from breast to artificial feeding but also in part to a tendency toward an increase in the mortality from these causes among the artificially fed to a maximum in the third month.

The rate from the group of epidemic and other communicable diseases, including tetanus, tuberculosis, and syphilis, was highest in the first month of life, when it was 1. It decreased to the minimum of 0.3 in the sixth and seventh months, from which point it increased again to 0.8 in the twelfth. This group, however, includes a considerable number of diseases, each of which has its own tendency to vary with age. Two-thirds of the deaths from syphilis and one-fourth of those from erysipelas, it may be noted, occurred in the first month, but only 1 in 25 of the deaths from the other diseases included in the group occurred during this period. The rate of mortality from whooping cough tended to decrease after the fourth month, while deaths from measles practically all occurred after the seventh and those from diphtheria were largely concentrated in the last three months of the first year. (See General Table 1, p. 186.)

The correlation between age and mortality rate is to be ascribed, doubtless, to the relationships existing between age, physiological changes, and the several diseases. Thus the influence of natal and prenatal causes, and in particular the sudden change of environment at birth, produce an extremely high mortality during the first few days after birth. The influence of these causes upon the death rates rapidly disappears, and the infants who survive the first week or two have in a sense passed the first crisis in their adjustment to their new environment. But immediately new dangers arise in the form of respiratory diseases, feeding difficulties, and epidemic and other communicable diseases. These dangers are encountered by many infants before they have developed resistance; and the correlation of age with the incidence of these diseases is, therefore, explained largely by its connection with the physiological changes that produce changes in the infants' resistance.

SEASONAL CONDITIONS

The influence of seasonal conditions upon mortality from certain diseases has already been touched upon in the discussion of causes of death. In Table 5 the deaths from each of the principal groups of causes are classified by the calendar months in which they occurred. The table also shows for each of these groups of causes the ratio of the average daily number of deaths in each month to the average daily number of deaths during the year.

Not only do differences between summer and winter have an important influence on the incidence of gastric and intestinal and respiratory diseases, but this very influence shows how important are variations between seasons in different years in producing fluctuations in infant mortality rates. To some extent the variations here shown in the mortality from these diseases may have been due to peculiar conditions existing in the particular cities and years selected for study. But the data available for this study were not adapted to bring out differences in mortality in different years, since in each city births for but a single year were studied.

The differences in the rates according to seasons are most striking in the case of gastric and intestinal diseases, the maximum monthly mortality from which was 13 times as great as the minimum. The maximum occurred in August, the minimum in January. This "summer peak" is a familiar characteristic of mortality from these causes.

TABLE 5.—*Calendar month of death, by cause; infant deaths in eight cities*

Calendar month of death	Infant deaths from specified causes											
	All causes		Gastric and intestinal diseases		Respiratory diseases		Early infancy and malformations		Epidemic and other communicable diseases		Other causes	
	Number	Ratio[1]	Number	Ratio[1]	Number	Ratio[1]	Number	Ratio[1]	Number	Ratio[1]	Number	Ratio[1]
January	177	81.6	15	23.7	58	152.1	56	70.8	21	154.0	27	117.7
February	219	111.7	20	35.0	76	220.7	77	107.8	16	129.9	30	144.8
March	233	107.4	21	33.2	63	165.2	102	129.0	19	139.3	28	122.1
April	196	93.3	19	31.0	53	143.6	86	112.4	16	121.2	22	99.1
May	168	77.4	23	36.4	32	83.9	77	97.4	15	110.0	21	91.5
June	153	72.9	33	53.9	24	65.0	72	94.1	6	45.5	18	81.1
July	306	141.0	163	257.7	19	49.8	82	103.7	14	102.6	28	122.1
August	324	149.3	198	313.1	12	31.5	76	96.1	17	124.6	21	91.5
September	265	126.2	132	215.7	21	56.9	88	115.0	9	68.2	15	67.6
October	199	91.7	69	109.1	28	73.4	73	92.3	10	73.3	19	82.8
November	149	71.0	23	37.6	25	67.8	73	95.4	8	60.6	20	90.1
December	166	76.5	27	42.7	39	102.3	67	84.8	11	80.6	22	95.9

[1] Ratio of the average daily number of deaths in each month to the average daily number of deaths throughout the year.

The group of respiratory diseases, on the other hand, caused markedly higher mortality during the winter than during the summer months. Though the contrast between the seasons was not so great as in the case of gastric and intestinal diseases, the mortality in February, when the greatest number of deaths from this cause occurred, was seven times as high as that in August, when the smallest number occurred.

Deaths from epidemic and other communicable diseases, which were relatively few in number, were more prevalent in the late winter and early spring than in the late autumn and early winter.

The mortality from malformations and causes peculiar to early infancy showed comparatively slight fluctuations from month to month during the year. It was highest in March. Since almost all the deaths from these causes occurred during the first month after birth, the influence of seasonal conditions was practically inseparable from the influence associated with month of birth, which may have included, besides seasonal influences upon the infants, the effects of variations in the mothers' health and condition associated with the season. This subject is discussed in connection with the effect of month of birth.

MONTH OF BIRTH

A question closely allied to the two preceding topics is that of the influence of month of birth upon infant mortality. To a large extent variations in mortality among infants born in the different months are due to variations in the effect of seasonal influences upon babies of different ages. Infants born in September, for example, are too young for the hot weather of that month to produce among them a heavy mortality from gastric and intestinal diseases, and by the time summer comes again they are already 8 or 9 months old and have passed the period when these diseases are most deadly. Infants born in April, on the other hand, are exposed to the hot weather of the following summer just at the ages when the gastric and intestinal diseases appear to cause the heaviest mortality. The month of birth may therefore be a factor in the infant death rate through the connection between calendar month of birth, calendar months of heaviest mortality, and ages when the incidence is greatest of diseases the prevalence of which varies with the season.

In addition to influencing mortality through the effect of the seasons upon deaths from certain causes and at certain ages, month of birth may influence the infant death rate through the effect of the seasons upon the health of mothers and thus indirectly upon the vitality of their babies at birth. It is a well-known fact that morbidity and mortality rates among adults are lowest in the autumn months, September, October, and November, and highest in the late winter and early spring. It might be expected that the favorable or unfavorable influences which seasonal conditions exert over the health of expectant mothers would extend to the infants born during or soon after the periods of the year most healthful or least healthful for adults. But so far as the mortality during the first month of life is concerned this indirect influence of the seasons through the mother's physical condition can scarcely be distinguished from their direct influence upon the health of the infant.

The death rates, for each month of life, of the infants born in each calendar month are presented in Table 6. The mortality in the first month of life was highest in March and lowest in October, corresponding fairly well with the periods of highest and lowest mortality among adults. Infants born in the four months from January to April had rates of neonatal mortality markedly above average, and those born in the three months September, October, and December had rates markedly below average.

An examination of the death rates for the later months of life reveals marked variations among the different month-of-birth groups. Thus of the rates in the third month those for the infants born in May, June, and July were over twice as high as those for the infants born in any other month except December; of the rates in the sixth month those for the infants born in January, February, and March were markedly higher than those for the infants born in any other month.

This examination shows, indeed, that the rates in any given month of life were highest for the month-of-birth groups that arrived at that month of life in the summer season, when the mortality from gastric and intestinal diseases was greatest.

TABLE 6.—*Monthly death rates, by month of life and calendar month of birth; infants in eight cities* [1]

Calendar month of birth	Monthly death rates											
	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	44.8	9.3	8.1	8.0	7.7	7.4	6.3	5.8	5.7	5.3	3.9	4.5
January	49.2	13.5	5.7	2.9	4.0	11.0	14.0	8.9	4.2	1.8	3.6	1.2
February	46.5	5.2	5.8	5.2	8.7	14.1	11.3	8.4	1.8	3.0	1.2	5.5
March	53.6	6.8	3.2	5.8	12.8	10.8	8.2	4.9	1.7	3.9	3.9	2.8
April	49.1	4.0	6.3	19.7	15.4	9.6	4.9	1.8	4.9	4.3	3.7	7.4
May	43.9	3.4	17.1	12.2	9.4	7.1	2.4	5.4	6.6	3.0	6.1	4.9
June	42.3	20.8	13.6	8.8	8.3	4.5	5.6	6.8	5.1	6.9	5.8	4.1
July	47.7	11.5	14.2	7.5	3.8	4.3	3.3	5.5	7.7	4.4	2.8	5.0
August	42.6	11.8	4.9	7.1	6.0	5.5	3.3	4.5	6.2	1.1	2.3	7.3
September	41.1	7.7	5.0	5.6	6.7	5.1	4.0	4.0	5.7	9.8	5.2	7.6
October	37.4	9.0	5.9	6.5	7.6	8.2	5.0	3.3	5.6	6.7	6.2	4.5
November	44.6	9.6	6.2	8.6	6.9	3.5	2.9	6.4	8.2	14.2	4.2	2.4
December	39.1	7.5	8.6	7.1	3.3	5.0	10.5	10.1	10.7	4.0	1.7	1.1

[1] For number of deaths see General Table 3, p. 187.

The heavy mortality from gastric and intestinal diseases in the summer months appeared, then, to be the dominating influence in the mortality rates for each of the months of life after the first. This influence was most marked in the months from the second to the fourth and was relatively slight in the later months of the first year, a fact which corresponds with the point already made that the heaviest mortality from gastric and intestinal diseases was found in the second, third, and fourth months.

The effect of seasonal variations in mortality from respiratory diseases, the incidence of which appeared to be greatest in the first two months of life, is more difficult to trace in Table 6. A heavy mortality from these causes doubtless contributed to the large proportion of deaths in the first month of infants born during the winter and early spring and was perhaps responsible for the high rate in the second month of infants born in January.

Variations in the mortality among the babies born in the different calendar months, by cause of death, are shown in Table 7. The rate from gastric and intestinal diseases was lowest for babies born in August and was markedly below average for those born in September and October. Infants born in these months escaped the heaviest incidence of death from gastric and intestinal diseases during their first summer because they were then below the most fatal ages for these diseases, and by the time their second summer had come they had passed those ages. The highest rate from gastric and intestinal diseases was found among babies born in April, who were from 2 to 5 months old during the critical period of the summer. The rates from these causes were also very high for babies born in January, February, and June. For some reason they were slightly below average for babies born in March.

Contrary to what might be expected from the fact, brought out clearly in Table 5 (p. 26), that the months from January to April had the highest mortality from respiratory diseases and from the further fact that the incidence of death from these diseases was greatest during the first two months of life, the highest rate from these causes was found among infants born in July, and the next highest among infants born in September. On the other hand, infants born in March, and next to them those born in October, November, and December, had the lowest mortality rates from respiratory diseases. But the number of deaths from these causes was not large, and the figures may therefore be subject to considerable chance variation. It may be that the influence of the seasons upon the mother's health, which seemed to find confirmation in the low neonatal mortality rates among babies born from September to December, played a part in the mortality from respiratory diseases among these babies.

The total effect of these variations in the seasonal and other influences to which the infants who were born in different months were subjected is shown in the mortality rates from all causes. The lowest rates were for babies born in August, September, October, and December; the highest were for babies born in June, April, and May. In producing this effect variations in the incidence of death from gastric and intestinal diseases seem to have been the predominating factor.

TABLE 7.—*Infant mortality rates, by cause of death and calendar month of birth; live births in eight cities* [1]

Calendar month of birth	Live births	Infant mortality rates from specified causes						
		All causes	Gastric and intestinal diseases	Respiratory diseases	Malformations	Early infancy	Epidemic and other communicable diseases	Other causes
January	1,871	114.4	39.6	19.8	5.3	33.7	5.3	10.7
February	1,828	111.6	41.0	20.8	2.7	32.8	5.5	8.8
March	2,016	113.1	29.3	12.9	6.4	44.1	7.9	12.4
April	1,832	124.5	42.6	19.7	4.9	43.7	4.9	8.7
May	1,845	115.4	33.1	21.7	5.4	37.4	8.7	9.2
June	1,960	125.5	39.3	20.4	4.6	38.3	10.7	12.2
July	2,013	112.3	27.8	24.8	5.0	37.3	5.5	11.9
August	1,949	98.5	21.5	19.0	2.1	34.4	8.7	12.8
September	1,897	102.8	22.7	22.7	1.6	34.3	8.4	13.2
October	1,952	101.4	24.1	17.9	4.6	29.7	7.2	17.9
November	1,861	112.3	33.3	17.7	4.3	37.1	6.4	13.4
December	1,943	104.0	35.5	18.0	4.6	30.9	5.1	9.8

[1] For number of deaths see General Table 2, p. 187.

SEX OF INFANT

In the entire group studied male births preponderated over female in the ratio of 1,034 to 1,000. This preponderance of male births is similar to that shown in practically all statistics on this subject.

The infant mortality rate for the male infants (123) was nearly one-fourth higher than the rate for female infants (99. 1). This contrast, also, is in accordance with the data obtained in other studies of infant mortality. In the United States birth-registration area in 1915, for example, the mortality rate for male infants was 23 per cent higher than that for female infants, the rates being 109.9 and 89.4, respectively.[1]

This excess mortality among male infants during the first year of life largely offsets the preponderance of males among all infants born. In the group studied the number of boys surviving at the end of the first year of life was only slightly greater than the number of girls. The ratio of boys to girls dropped from 1,034 to 1,000 at birth to 1,006 to 1,000 at the first birthday.

TABLE 8.—*Infant mortality rates, by cause of death and sex; live births in eight cities*

Cause of death	Male infants		Female infants	
	Deaths	Infant mortality rates	Deaths	Infant mortality rates
All causes	1,436	123.0	1,119	99.1
Gastric and intestinal diseases	413	35.4	330	29.2
Respiratory diseases	262	22.4	188	16.6
Malformations	56	4.8	43	3.8
Early infancy	473	40.5	357	31.6
Epidemic and other communicable diseases	80	6.9	82	7.3
External causes	10	.9	4	.3
Diseases ill defined and unknown	30	2.6	28	2.5
Other causes	112	9.6	87	7.7

The explanation of this excess mortality among male infants is sometimes offered that male children are larger and heavier at birth than female children and hence that the difficulty of labor is greater in the case of male infants. This fact may well explain the heavier mortality among male infants from causes peculiar to early infancy, which appears in the figures of Table 8. Also in line with this explanation is the fact that the proportion of premature births was larger for male than for female infants. Of the male infants 5.4 per cent were prematurely born as compared with 4.7 per cent of the female. The excess mortality among the male babies from causes peculiar to early infancy finds a partial explanation in this slightly greater proportion of premature births. (See General Table 4, p. 188.)

[1] Compiled from Birth Statistics, 1915, p. 21, and Mortality Statistics, 1915, pp. 218-242 (U. S. Bureau of the Census).

Among the prematurely born, as well as among the infants born at term, however, the boys had higher mortality rates than the girls, as appears in Table 9. Among the full-term infants the rate for the males was 97.2 as compared with 78.7 for the females; among the prematurely born the rate for the males was 570.7 as compared with 504.7 for the females. The mortality of the males, therefore, exceeded that of the females among the full-term infants by 23.5 per cent and among the prematurely born by 13.1 per cent; when no allowance was made for the greater proportion prematurely born among the male infants, their mortality exceeded that of the female infants by 24.1 per cent.

TABLE 9.—*Infant mortality rates, by sex and term; live births in eight cities*[1]

Term	Infant mortality rates	
	Male	Female
Total	123.0	99.1
Full term	97.2	78.7
Premature	570.7	504.7

[1] For basic figures see General Table 4, p. 188.

The differences in death rates between the two sexes were not restricted to rates from causes peculiar to early infancy; the male infants had higher death rates from practically every cause. Furthermore, the higher mortality of males is not due to any tendency toward an excessive preponderance of males over females in race and nationality groups in which the rates were above average, nor to any such excessive preponderance in the low-income groups, since the ratio of the sexes at birth did not vary significantly in these several groups. Nor is the higher mortality from gastric and intestinal diseases among males explained by a greater tendency to feed them artificially; although a slightly larger proportion of the male infants were artificially fed, as indicated by figures for the third, sixth, and ninth months, the excess was only 1 per cent—too small to account for the difference in the death rates.[2] The factors explaining the excess mortality of males must therefore include a certain difference in physical vitality to the disadvantage of the male sex. In this connection it is of interest to note that at every age throughout life—with the possible exception, in some countries, of a period of a few years around the ages of 25 to 30—the mortality rate among males is greater than that among females. But though the difference in mortality at other ages may perhaps be explained by differences in occupations and environment, no such explanation will account for the greater mortality among males in infancy.

[2] See General Table 5, p. 188. A 1 per cent greater proportion of male infants artificially fed would have accounted for a total of 17 deaths in excess of the number expected if the proportion of artificially fed had been the same as for female infants. On this basis the mortality rate for males would have been 121.5 instead of 123.

PHYSICAL CONDITION OF MOTHER

The data available on the physical condition during pregnancy or at childbirth of the mothers included in this study are very limited. Records of complete physical examinations would afford the best basis for a discussion of the influence exerted by the mother's health upon the chances of life of her child. Because of the particular character and methods of the field investigations on which this study is based, it was not feasible to secure such records. These investigations were limited to data available on the birth or death certificates or on other records already taken and to information obtained by interviews with the families. The present report can throw light, therefore, on only a few questions relating to the influence of the health of mothers on infant mortality rates.

The only point which bears directly upon the question of the mother's physical condition and on which complete data were obtained for all cities was whether the mother died during or immediately following childbirth or within one year after the birth. Besides this, in one city, Baltimore, data were obtained for a small group of mothers to the effect that they either had or had previously had tuberculosis; this information was secured from the records of organizations to which these mothers had applied for treatment, and the group, therefore, includes only certain tuberculous mothers and not all. In this city, also, data were obtained from the records of hospitals and their out-patient departments and from the records of agencies giving prenatal or confinement care as to certain complications of pregnancy and confinement the influence of which can be related to the mortality among infants born to the mothers concerned.

Other factors, which are treated elsewhere in this report, may have produced their effect upon infant mortality partly or wholly through their effect upon or correlation with the mother's health and condition during pregnancy. These factors include the mother's age at the time of the birth, order of birth, interval since preceding birth, the mother's employment during pregnancy, and the economic status of the family. These points are discussed elsewhere partly because their effect in many cases is not confined to the indirect influencing of the mother's health and partly because direct evidence connecting them with specific items of physical condition was lacking for the mothers included in the present study.

DEATH OF MOTHER

The number of live-born infants whose mothers died at or during the year following confinement was only 0.6 per cent of the total number.[1] Among these infants a very high mortality prevailed (450 per 1,000 live births), one nearly as high as that for the prematurely born and over four times as high as that for babies whose mothers lived for a year or more after their birth.

[1] For data on stillbirths see Appendix A, pp. 167–173.

Of the infants whose mothers died within one month after confinement—in most cases, probably, from causes connected with pregnancy or childbirth—a considerably larger proportion failed to live until their first birthday than of the infants whose mothers died between one month and one year after confinement, the infant mortality rates being respectively 607 and 367.

TABLE 10.—*Mortality rates among infants in eight cities whose mothers died at or within one year after confinement*

Death of mother at or within one year after confinement	Live births	Infant deaths from—			
		All causes		Early infancy	
		Number	Infant mortality rates [1]	Number	Infant mortality rates [1]
Total	22,967	2,555	111.2	830	36.1
Mother died within one year	140	63	450.0	36	257.1
Within one month	56	34	----	26	----
After one month	79	29	----	10	----
Time not reported	5	----	----	----	----
Mother survived the year	22,827	2,492	109.2	794	34.8

[1] Not shown where base is less than 100.

Causes of death of infant.

The excessive mortality among the babies whose mothers died was due largely to causes peculiar to early infancy. The mortality rate from these causes for this group of infants was 257.1, or over seven times as high as the rate which prevailed among other infants (34.8). Furthermore, it was much higher for the infants whose mothers died within one month than for those whose mothers died between one month and one year after confinement (464 as compared with 127). The death rates from other causes, also, were higher for these infants than for the others, but the differences between the rates for the two groups were not so great. Nevertheless, the mortality from gastric and intestinal diseases among the infants whose mothers died was over twice as high as among those whose mothers lived. (See General Table 7, p. 189.)

Prematurity.

To a considerable extent the high mortality among the infants whose mothers died was associated with premature birth, which may have been caused by the same conditions that resulted in the mothers' deaths. Of the infants whose mothers died 20 per cent were premature as compared with only 5 per cent of all infants. Of those whose mothers died within one month after confinement 39 per cent were premature as compared with 7.6 per cent of those whose mothers died between one month and one year after confinement. This unusually high proportion of premature births among infants whose mothers died within one month after confinement accounts in large part for the extremely high rate of mortality for this group of babies from causes peculiar to early infancy. Since, however, all but one of these prematurely born infants died under the age of 1 year, the mothers'

deaths evidently increased the hazard to the prematurely born even beyond that associated with prematurity. (See General Table 7, p. 189.)

Type of feeding.

As would be expected, artificial feeding was much more prevalent among infants whose mothers died within one year after confinement than among those whose mothers survived the year. Of the months lived by the former from birth up to the end of the ninth month 81.8 per cent were months of artificial feeding as compared with only 24.6 per cent in the case of the latter. (See General Tables 8 and 9, pp. 189, 190.) When all infants who died in the first month were left out of account (including those who died not fed) it was found that the mortality among those whose mothers died was 4.2 times that among all the others. When in this group the mortality among the former was compared with that among the latter who received the same type of feeding, the average ratio between the death rates in the two groups was reduced to 2.5. (See General Table 10, p. 190.) Evidently differences in type of feeding received by infants who survived the first month account for a considerable part, but not all, of the higher mortality among children of mothers who died within one year after confinement.

TUBERCULOSIS OF MOTHER

The number of live births to mothers in Baltimore who were reported to have or to have had tuberculosis was 96. For reasons already mentioned, this figure probably understates the true number of such cases. Of these infants 26 died under the age of 1 year, giving an infant mortality rate of 270.8, or over two and one-half times the rate (102) for the other infants in the same city. Among the infants whose mothers were reported to have had this disease 3 deaths from tuberculosis occurred, in comparison with an expected number of only 0.1 if the average rate of mortality from tuberculosis had prevailed for this group. Not only was the rate from tuberculosis high, but the rates from all other causes, as shown in Table 11, were far above those for infants whose mothers were not known to have had tuberculosis. Though the numbers are small, these differences suggest that the mother's having tuberculosis exerts a strong adverse influence over the chances of life of her baby. (See General Table 11, p. 190.)

TABLE 11.—*Mortality rates among infants in Baltimore whose mothers had had tuberculosis*

Condition of mother	Live births	Infant deaths from specified causes					
		All causes		Tuberculosis		Other causes	
		Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates
Total	10,797	1,117	103.5	15	1.4	1,102	102.1
Tuberculous	96	26	270.8	3	31.3	23	239.6
Not known to have been tuberculous	10,701	1,091	102.0	12	1.1	1,079	100.8

COMPLICATIONS OF PREGNANCY AND CONFINEMENT

In addition to such data as that on tuberculosis, details concerning complications of pregnancy and confinement afford information on the health of the mother during this period. The findings of urinalysis and of physical examination, and information in regard to specific toxemias and specific illnesses of pregnancy, would be of great value in the present study if available; unfortunately data are at hand on only one such point—whether or not the mother had convulsions.[2]

A complication of pregnancy or confinement that is often associated with a serious condition of the mother is convulsions. Of the total number of live-born infants in the Baltimore study convulsions were reported for the mothers of only 42—a number which is doubtless also a minimum statement. In one-sixth of these cases the mother died. One-third of the babies born to mothers who had convulsions were premature. Two-thirds of the premature and one-fifth of the full-term babies whose mothers had convulsions died under 1 year of age, the infant mortality rate for the group as a whole being 357.1. Seven-tenths of the deaths were from causes peculiar to early infancy, from which the rate was 261.9. (See General Table 12, p. 191.)

MEDICAL CARE DURING PREGNANCY

Other things being equal, the quality of care received by the mothers during pregnancy would be expected to influence the infant mortality rate. Difficulty is experienced, however, in demonstrating the influence of prenatal care upon infant mortality because of the fact that in most groups a much larger proportion of the prospective mothers who are in poor health than of those who are in good health seek the advice of physicians. As a result the group of mothers who have had medical prenatal care is overweighted, as compared with the group of those who have not had such care, with cases of special physical disability. Only a method of classification, on the basis of the mother's health, into groups in each of which the health of mothers who have had prenatal care will be equal, on an average, to that of those who have not had it can eliminate this difficulty.

In the present study no such classification could be attempted. Inquiries in regard to medical prenatal care were made only in Baltimore; and even in that city full data regarding the health and condition of the mothers during pregnancy were not available, and consequently the results are strongly influenced by the greater tendency of mothers who were in poor physical condition to consult physicians. When the live-born infants included in the Baltimore study were classified according to whether their mothers had received a minimum of prenatal care—i. e., had had urinalyses or had consulted physicians in regard to their pregnancy—the infant mortality rate was found to be decidedly higher (113.3) for those whose mothers had no prenatal care than that (93.8) for those whose mothers had at least this minimum. An analysis by cause of death shows, however, that the rates from causes peculiar to early infancy, which would presumably be most affected by prenatal care, were practically identical—37.1

[2] For data relating to stillbirths see Appendix A, pp. 167–173.

in the former group and 38 in the latter—and that the difference between the general rates of the two groups was caused primarily by higher mortality from gastric and intestinal and respiratory diseases among the infants whose mothers had received no care from physicians during pregnancy. This result may indicate that the mothers who consulted physicians during pregnancy also consulted physicians promptly when their babies were ill. But so far as prenatal care is concerned it appears to show merely that the two groups of mothers were not comparable as to physical condition and that therefore the information obtained can not be expected to show the influence of prenatal care on the infant mortality rate. (See General Table 13, p. 191.)

SUMMARY

Although, unfortunately, the points upon which definite data were available are limited, the evidence adduced shows clearly the potent influence which the health and physical condition of the mothers had upon the infants' chances of life. In cases in which the mother died during the year following confinement—in most cases as a result of a condition that originated before the infant's birth—the influence of the mother's ill-health appeared in high rates of premature birth, of death within the first month, and of deaths from causes peculiar to early infancy. These high rates were especially marked in those cases in which the mother died at childbirth or within the following month—almost all from puerperal causes. Of the infants whose mothers died a very large proportion were artificially fed from birth, owing chiefly either to the death of the mothers or to health conditions which prevented them from nursing the children.

The babies whose mothers had or had previously had tuberculosis and those whose mothers had convulsions during pregnancy or confinement had higher mortality rates than the other babies.

Other points which may have had a direct connection with the mother's health and physical condition are taken up elsewhere. The mortality among babies born to mothers under 20 years of age was found to be excessive, owing probably to the influence of the mothers' physical immaturity (pp. 39–48). First births were subject to a higher mortality than second or third births—a fact probably due to or connected in some way with the greater physical strain attending a first labor (p. 48). The mother's employment away from home during pregnancy was found associated with markedly high rates of mortality from causes peculiar to early infancy, of premature births, and of stillbirths, arising doubtless from the connection between such employment and the mother's health (pp. 131–134). There seems also to have been a close correlation between the father's earnings and the amount of skilled care available for the mother during pregnancy and confinement (pp. 162–163).

The present data afford no clear evidence as to the influence of prenatal care on infant mortality. Information is available for one city in regard to consultation of a physician during pregnancy; but since, unfortunately, in the absence of general medical care for all expectant mothers, those who consult physicians are predominantly those who are forced by their poor physical condition to do so, a

comparison of this group with that of other mothers affords no clear evidence of the value of such consultation. Other studies [3] have proved clearly the importance of prenatal care for expectant mothers, showing that by means of systematic and general care the mortality in the first month may be reduced to nearly half its usual proportions and a decided decrease effected in the rates of stillbirths and of premature births.

[3] Dublin, Louis I.: "The mortality of early infancy." Transactions of the Thirteenth Annual Meeting of the American Child Hygiene Association, 1922, pp. 83–95.
Lobenstine, Ralph W., M. D.: "The maternity center association." Mother and Child, Vol. IV, pp. 157–163.

FREQUENCY OF BIRTHS

The present section is devoted to a discussion of those factors—age of mother, order of birth, interval since preceding birth, and commencement of a succeeding pregnancy before the infant has reached his first birthday—that together make up the influences associated with the "birth rate." A high birth rate usually signifies that women marry young and bear many children, who follow one another at relatively short intervals. So far as the birth rate exerts an influence over the general infant mortality rate, it must do so by affecting the chances of life of each individual child. But with respect to any one infant no birth rate can be calculated. The influence of the birth rate upon infant mortality, therefore, except so far as it is dependent upon other factors, such as the economic status of the family, must be a joint resultant of the influences of mother's age, number in order of birth (or number of preceding births), interval since the last preceding birth, and interval before the beginning of a succeeding pregnancy.

AGE OF MOTHER

When the births included in this study were classified according to the ages of the mothers, the mortality rates were found to be above average for the infants of both the youngest and the oldest mothers (Table 12). For the group of babies whose mothers were under 20 years of age the mortality rate was 135.7. From this point it fell to 103.5 for the babies whose mothers were between 20 and 25, and to 101.4 for those whose mothers were between 25 and 30 years of age. From this low figure the rate rose to 136.7 for the babies of mothers who were 40 and over. When the group under 20 was subdivided, the mortality rate for the infants of the mothers who were under 18 was found to be 160.3. When the group 40 and over was similarly subdivided, the mortality rate for the infants of mothers between 40 and 45 was found to be only slightly higher than that for the infants of mothers between 35 and 40; the rate for the infants of mothers 45 and over appeared very high, but the number of infants included in this group was too small to allow any very definite conclusion to be drawn.

TABLE 12.—*Infant mortality rates, by age of mother; live births in eight cities*

Age of mother	Live births	Infant deaths	Infant mortality rates	Age of mother	Live births	Infant deaths	Infant mortality rates
Total	22,967	2,555	111.2	30–34	4,231	443	104.7
				35–39	2,688	340	126.5
Under 18	343	55	160.3	40 and over	958	131	136.7
18–19	1,241	160	128.9	40–44	914	120	131.3
20–24	6,879	753	109.5	45 and over	44	11	[1] (250.0)
25–29	6,618	671	101.4	Not reported	9	2	---

[1] Rate based on less than 100 cases.

Causes of death of infant.

According to Table 13 the most marked variation by age of mother occurred in the mortality from causes peculiar to early infancy. The trend of the rates from these causes was similar to that from all causes. Thus the rate was highest—54.3—for infants of mothers under 20 years of age; reached its lowest point—32.6—for infants of mothers aged 25 to 29 years; and rose again to 48 for infants of mothers 40 years of age and over.

A similar tendency appeared in the mortality from gastric and intestinal diseases. In this case the lowest rate fell in the group 30 to 34 years; but all the rates in the groups with mothers from 20 to 34 years of age were markedly below those for the groups with mothers under 20 or 35 and over.

The figures for other causes, however, did not reveal any tendency toward high mortality among the infants of the youngest mothers, and although the rates for the infants of the oldest mothers appeared to be highest, the trend toward higher mortality among the infants of older mothers was not so clear nor so definite as that shown in the rates from causes peculiar to early infancy and from gastric and intestinal diseases.

TABLE 13.—*Infant mortality rates, by cause of infant's death and age of mother; live births in eight cities*

Age of mother	Live births	Infant deaths from specified causes							
		All causes		Gastric and intestinal diseases		Early infancy		Other causes	
		Number	Infant mortality rates [1]	Number	Infant mortality rates [1]	Number	Infant mortality rates [1]	Number	Infant mortality rates [1]
Total	22,967	2,555	111.2	743	32.4	830	36.1	982	42.8
Under 20	1,584	215	135.7	62	39.1	86	54.3	67	42.3
20–24	6,879	753	109.5	212	30.8	232	33.7	309	44.9
25–29	6,618	671	101.4	201	30.4	216	32.6	254	38.4
30–34	4,231	443	104.7	121	28.6	140	33.1	182	43.0
35–39	2,688	340	126.5	110	40.9	109	40.6	121	45.0
40 and over	958	131	136.7	36	37.6	46	48.0	49	51.1
Not reported	9	2		1		1			

[1] Not shown where base is less than 100.

Neonatal mortality.

The mortality during the first month of life reflects the differences in the rates from causes peculiar to early infancy. Thus the highest rates of neonatal mortality, as Table 14 shows, were found among infants of mothers under 20 and of mothers 40 years of age and over.[1]

Order of birth.

A close correlation was found between age of mother and order of birth, as Table 15 shows. Of the births to mothers under 20 years of age only one-tenth of 1 per cent were of the orders fifth and later, for which the infant mortality rates were above average. Of the

[1] For rates for later months of the first year of life see General Table 14, p. 191.

births to mothers 40 years of age and over, on the other hand, 85.6 per cent were fifth and later in order. (See General Table 15, p. 192.)

When allowance was made for the interrelation between age of mother and order of birth, it appeared that a considerable part of the greater mortality among infants of the older mothers was due to the associated factor of order of birth. In fact, the excess mortality associated only with mother's age seemed to be concentrated largely in the group of infants born to the youngest mothers. (Table 16.) Nevertheless, that the apparent influence of age of mother was not due entirely to order of birth was shown clearly when an analysis was made of the mortality among first births. Obviously in this case neither order nor interval since preceding birth can affect the comparison. Yet the mortality rates by age of mother had a trend similar to that observed when all births were grouped together: The infants of the youngest and of the oldest mothers had the highest rates and those of mothers of intermediate ages the lowest. (Table 17.)

TABLE 14.—*Neonatal mortality rates, by age of mother; live births in eight cities*

Age of mother	Live births	Deaths under 1 month	Neonatal mortality rates	Age of mother	Live births	Deaths under 1 month	Neonatal mortality rates
Total	22,967	1,028	44.8	30–34	4,231	163	38.5
				35–39	2,688	135	50.2
Under 20	1,584	100	63.1	40 and over	958	52	54.3
20–24	6,879	299	43.5	Not reported	9	1	----
25–29	6,618	278	42.0				

TABLE 15.—*Proportion of births fifth and later in order, by age of mother; live births in eight cities* [1]

Age of mother	Live births			Age of mother	Live births		
	Total	Fifth and later in order			Total	Fifth and later in order	
		Number	Per cent [2]			Number	Per cent [2]
Total	22,967	5,974	26.0	30–34	4,231	1,930	45.6
				35–39	2,688	1,842	68.5
Under 20	1,584	2	.1	40 and over	958	820	85.6
20–24	6,879	178	2.6	Not reported	9	4	----
25–29	6,618	1,198	18.1				

[1] For basic figures see General Table 15, p. 192.
[2] Not shown where base is less than 100.

TABLE 16.—*Relative mortality, by age of mother, when influences of order of birth, interval since preceding birth, and both factors together are eliminated; live births in eight cities and single live births in Baltimore*

Age of mother	Ratio of actual to expected infant deaths [1]				
	Eight cities		Baltimore		
	On basis of average rate	Eliminating influence of order of birth	On basis of average rate for single live births	Eliminating influence of interval since preceding birth	Eliminating both influence of interval since preceding birth and order of birth
Total	100.0	100.0	100.0	100.0	100.0
Under 20	122.0	132.0	124.9	135.7	156.4
20–24	98.5	106.9	98.7	97.4	108.6
25–29	91.2	95.2	85.6	85.6	90.1
30–34	94.2	90.4	91.8	93.7	91.2
35–39	113.8	97.5	124.7	127.6	109.3
40 and over	122.9	92.3	121.3	127.5	93.2

[1] For basic figures see General Table 16, p. 192.

TABLE 17.—*Infant mortality rates, by age of mother and order of birth; live births in eight cities*

Order of birth	Infant mortality rates [1]						
	Total	Age of mother					
		Under 20	20–24	25–29	30–34	35–39	40 and over
Total	111.2	135.7	109.3	101.4	104.7	126.5	136.7
First	104.7	125.5	100.5	90.4	102.8	131.6	----
Second	95.7	167.2	105.6	74.0	76.8	112.7	----
Third	104.6	----	125.0	103.8	82.1	73.1	----
Fourth	108.8	----	155.3	99.7	106.6	82.1	----
Fifth	118.8	----	97.7	136.2	96.7	127.5	----
Sixth	122.7	----	----	150.4	102.1	128.8	----
Seventh	136.8	----	----	195.7	121.8	131.3	108.9
Eighth	135.9	----	----	----	137.2	121.1	----
Ninth	146.8	----	----	----	174.6	133.9	----
Tenth and later	181.5	----	----	----	228.1	193.6	159.6

[1] Not shown where base is less than 100.

Interval since preceding birth.

The interval since the preceding birth must also be considered in relation to the mother's age. Of the births second and later in order to mothers under 20 years of age, a much larger proportion were short-interval births than of similar births to older mothers, as Table 18 shows. Since the short-interval births were associated with a high infant mortality rate, as will be discussed more at length in a later section,[2] the high mortality, especially among births second and later in order to mothers under 20 years of age, may have been due in part to the influence of the short interval.

[2] For definition and discussion of interval since preceding birth see pp. 60–67.

When allowance was made for this correlation of age of mother and interval between births, the excess mortality among infants of mothers under 20 years of age appeared, in fact, to be slightly reduced. And when allowance was made not only for the correlation between age of mother and interval between births but also for that between each of these factors and order of birth, the influence of age of mother appeared to be shown almost wholly in a high mortality rate among infants of the youngest mothers. (See Text Table 16 and General Tables 17 and 18, pp. 42, 193, 194.)

TABLE 18.—*Proportion of short-interval births,*[1] *by age of mother; single live births in Baltimore second and later in order* [2]

Age of mother	Live births second and later in order—			Age of mother	Live births second and later in order—		
	Total	Following preceding births at short intervals [1]			Total	Following preceding births at short intervals [1]	
		Number	Per cent [3]			Number	Per cent [3]
Total	7,707	2,026	26.3	30–34	1,728	356	20.6
				35–39	1,111	187	16.8
Under 20	238	142	59.7	40 and over	392	45	11.5
20–24	1,849	702	38.0	Not reported	4	1	
25–29	2,385	592	24.8				

[1] For definition of interval see p. 60.
[2] For basic figures see General Table 17, p. 193.
[3] Not shown where base is less than 50.

Prematurity.

A markedly larger proportion of premature births was found for births to the younger than for those to older mothers. According to Table 19 the proportion decreased from 8.6 per cent among the births to mothers under 20 to a minimum of 4.1 per cent among those to mothers from 35 to 39 and then rose again to 4.8 per cent among those to mothers 40 years of age and over.[3]

The larger proportion of premature births to mothers under 20 years of age tends to account in part for the higher mortality from causes peculiar to early infancy among the babies born to these mothers. Perhaps the same fundamental factors that produce a high mortality from these causes—which have their origin largely in the care and condition of the mother during pregnancy and confinement—produce also a high proportion of premature births. Even after allowance was made for the greater prevalence of premature births, the mortality from causes peculiar to early infancy was much higher among the infants of the youngest mothers than among the infants of mothers of the next age group, 20 to 24 years.

[3] General Table 19 shows that this greater prevalence of premature births to young mothers was in part, at least, independent of the greater prevalence of premature among first births (p. 194).

TABLE 19.—*Proportion of premature births, by age of mother; live births in eight cities*

Age of mother	Live births			Age of mother	Live births		
	Total	Premature			Total	Premature	
		Number	Per cent [1]			Number	Per cent [1]
Total	22,967	1,158	5.0	30–34	4,231	182	4.3
Under 20	1,584	137	8.6	35–39	2,688	110	4.1
20–24	6,879	368	5.3	40 and over	958	46	4.8
25–29	6,618	314	4.7	Not reported	9	1	

[1] Not shown where base is less than 100.

Plural births.

In contrast to the greater prevalence of premature births to the youngest mothers, a markedly larger proportion of the infants born to older mothers than of those to younger mothers were twins and and triplets. (Table 20.) Other things being equal, the fact that plural births occurred more frequently to the older mothers would tend to produce a slightly higher average mortality among the infants of the older mothers. The influence of this tendency, however, is relatively slight. The trend of the mortality rates is practically the same for the single births as for all births, although the mortality among the infants of the youngest mothers appears relatively slightly greater and that among the infants of the oldest mothers relatively slightly less for single births than for all births. (Table 21.)

TABLE 20.—*Proportion of plural births, by age of mother; live births in eight cities*

Age of mother	Live births			Age of mother	Live births		
	Total	Plural			Total	Plural	
		Number	Per 1,000			Number	Per 1,000
Total	22,967	529	23.0	30–34	4,231	124	29.3
Under 20 years	1,584	13	8.2	35–39	2,688	82	30.5
20–24	6,879	124	18.0	40 and over	958	25	26.1
25–29	6,618	161	24.3	Not reported	9		

TABLE 21.—*Relative infant mortality rates, by age of mother, for single births and for all births; live births in eight cities*

Age of mother	Infant mortality rates				Age of mother	Infant mortality rates			
	All births		Single births			All births		Single births	
	Rate	Ratio to average rate (per cent)	Rate	Ratio to average rate (per cent)		Rate	Ratio to average rate (per cent)	Rate	Ratio to average rate (per cent)
Total	111.2	100.0	105.3	100.0	25–29	101.4	91.2	95.9	91.1
Under 20	135.7	122.0	131.1	124.5	30–34	104.7	94.2	98.1	93.2
20–24	109.5	98.5	103.5	98.3	35–39	126.5	113.8	120.5	114.4
					40 and over	136.7	122.9	128.6	122.1

Type of feeding.

The prevalence of artificial feeding appears to have varied with the age of the mother. (See General Table 22, p. 195.) Of infants surviving at the beginning of the third month, for example, those born to mothers 40 years of age and over had the largest proportion (27.8 per cent) and those born to mothers from 25 to 29 years of age had the smallest proportion (18.8 per cent) artificially fed. The proportion artificially fed of infants of the youngest mothers (20.5 per cent) was only slightly above that of infants of mothers from 25 to 29 years of age. By the time the ninth month was reached these differences in the prevalence of artificial feeding had largely disappeared. The highest percentages of infants surviving at the beginning of the ninth month who were artificially fed were found for the infants of the youngest mothers—36.9 per cent for the age group under 20 and 36.2 per cent for the group from 20 to 24—but these percentages were only slightly higher than the figure (36) for the age group 40 and over; the lowest percentage (33.1), was that of the infants of mothers 30 to 34 years of age. Except for the high percentage of infants who were artificially fed during the early months of life in the age-of-mother group 40 years and over, these differences in the prevalence of artificial feeding must be considered relatively slight when measured in terms of the influence which such differences might have upon the infant mortality rates in the several groups.

The prevalence of artificial feeding among the infants of mothers 40 years of age and over accounts in part for the excess mortality of this group. If the same proportion of these infants had been artificially fed as of the infants of mothers between 25 and 30 years of age, the mortality rate for the group would have been only 125.7 instead of 136.7. (Thus reduced, it would still have been higher than the rates for any except infants of the youngest mothers.)

The greater prevalence of artificial feeding among infants of mothers of the older age groups appeared, as Table 22 shows, to be connected with the age factor and to be independent, in part at least, of order of birth. The numbers artificially fed among infants of mothers 30 years of age and over were considerably greater than would have been expected on the basis of the proportions artificially fed among all births of the corresponding orders.

TABLE 22.—*Influence of age of mother upon the proportion of infants artificially fed during the third month of life, when influence of order of birth is eliminated; infants in eight cities*

Age of mother	Infants surviving at beginning of third month			Age of mother	Infants surviving at beginning of third month		
	Actual number artificially fed	Expected number artificially fed [1]	Ratio of actual to expected (per cent)		Actual number artificially fed	Expected number artificially fed [1]	Ratio of actual to expected (per cent)
Total	4,431	4,430.8	100.0	30–34	836	799.7	104.5
				35–39	569	536.4	106.1
Under 20	301	310.1	97.1	40 and over	249	215.3	115.7
20–24	1,291	1,327.8	97.2	Not reported	1	1.6	62.5
25–29	1,184	1,239.9	95.5				

[1] Expected at average proportions artificially fed in each order-of-birth group.

Color and nationality of mother.

According to Table 23, a considerably larger proportion of the infants born to mothers 40 years of age and over than of those born to mothers under 20 were of race or nationality groups which had higher than average infant mortality rates—37.9 per cent as compared with 23.5 per cent. In part, therefore, the higher mortality of the babies born to the older mothers may have been due to factors associated with nationality rather than to those associated with the mother's age.

The extent of the influence of the correlation between age of mother and nationality was comparatively slight, however. When allowance was made in Table 24 for this interrelation the mortality of babies of the oldest relatively to that of babies of the youngest mothers appeared slightly lower than before the correction was made, but otherwise the trend of the mortality rates by age of mother did not appear to have been materially altered.

TABLE 23.—*Proportion of births to mothers of nationalities with high infant mortality rates, by age of mother; live births in eight cities*

Age of mother	Live births—			Age of mother	Live births—		
	Total	To mothers of nationalities with high infant mortality rates[1]			Total	To mothers of nationalities with high infant mortality rates[1]	
		Number	Per cent			Number	Per cent
Total	22,967	7,428	32.3	30–34	4,231	1,490	35.2
				35–39	2,688	1,013	37.7
Under 20	1,584	373	23.5	40 and over	958	363	37.9
20–24	6,879	1,999	29.1	Not reported	9	8	----
25–29	6,618	2,182	33.0				

[1] Includes French-Canadian, Polish, Portuguese, "other foreign born," and colored. For basic figures see General Table 23, p. 195.

TABLE 24.—*Relative mortality, by age of mother, when influence of nationality of mother is eliminated; live births in eight cities*

Age of mother	Infant deaths			Age of mother	Infant deaths		
	Actual	Expected[1]	Ratio of actual to expected (per cent)[2]		Actual	Expected[1]	Ratio of actual to expected (per cent)[2]
Total	2,555	2,555.1	100.0	30–34	443	473.3	93.6
				35–39	340	305.3	111.4
Under 20	215	171.9	125.1	40 and over	131	111.1	117.9
20–24	753	756.5	99.5	Not reported	2	1.3	----
25–29	671	735.7	91.2				

[1] Expected at average rates for each color and nationality group irrespective of age of mother.
[2] Not shown where base is less than 100.

Earnings of father.

A larger proportion of births to mothers under 20 years of age (54.7 per cent) than of births to mothers of any other age group occurred in families in which the fathers earned less than $650. The contrast is even more marked when first births and later births are considered

separately. According to Table 25, of first births to mothers under 20, 51.8 per cent occurred in families in which the father's earnings were less than $650, as compared with half as large a proportion of first births to mothers 25 and over. In other words, in the higher-earnings groups the mothers were older at the time of the first births. Of second and later births to mothers under 20, 64.4 per cent occurred in the low-income group, as compared with approximately two-thirds as large a proportion of second and later births to mothers 25 and over.

When allowance was made for this interrelation between father's earnings and age of mother, the excess mortality among the births to the youngest mothers was somewhat further reduced, as Table 26 shows.

TABLE 25.—*Proportion of births in families in which the father earned less than $650, by age of mother and order of birth; live births in seven cities* [1]

Age of mother	Live births								
	Total	In families in which father earned less than $650		First			Second and later		
				Total	In families in which father earned less than $650		Total	In families in which father earned less than $650	
		Number	Per cent [2]		Number	Per cent [2]		Number	Per cent [2]
Total	21,536	9,133	42.4	5,908	2,157	36.5	15,628	6,976	44.6
Under 20	1,503	822	54.7	1,160	601	51.8	343	221	64.4
20–24	6,434	2,823	43.9	2,949	1,099	37.3	3,485	1,724	49.5
25–29	6,236	2,415	38.7	1,295	326	25.2	4,941	2,089	42.3
30–34	3,962	1,563	39.4	377	97	25.7	3,585	1,466	40.9
35–39	2,508	1,104	44.0	111	28	25.2	2,397	1,076	44.9
40 and over	884	399	45.1	14	5	-------	870	394	45.3
Not reported	9	7	-------	2	1	-------	7	6	-------

[1] For basic figures see General Table 24, p. 196.
[2] Not shown where base is less than 50.

TABLE 26.—*Relative mortality, by age of mother, when influence of earnings of father is eliminated; live births in seven cities*

Age of mother	Infant deaths			Age of mother	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)		Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,368	2,367.6	100.0	30–34	404	422.6	95.6
Under 20	206	179.3	114.9	35–39	318	277.1	114.8
20–24	699	717.3	97.4	40 and over	120	99.4	120.7
25–29	619	670.8	92.3	Not reported	2	1.1	----------

[1] Expected at average rates for each earnings-of-father group irrespective of age of mother.

Summary.

Among the first births age of mother appeared to influence mortality in such a way that the infants of the youngest and of the oldest mothers—those under 20 and those 40 years of age and over—had the highest rates.

Of births second and later in order, those to mothers under 20 years of age had the highest rate of mortality, owing in part to short intervals since preceding births, in part to the greater prevalence of premature births, and in part to the relatively low economic status of the families in which the infants were born, but also, apparently, in part to some factor associated with the mothers' age. The high mortality that appeared among infants born to the oldest mothers seems to have been due largely, if not wholly, to other factors than age[4]—order of birth, plural birth, and prevalence of artificial feeding—since a larger proportion of these than of infants born to younger mothers were of late orders or were twins or triplets, and a slightly larger proportion of them were artificially fed.

ORDER OF BIRTH

When the live births were classified by order[4] the infant mortality rates, after an initial drop from the first to the second birth, increased steadily with the order of birth, as Table 27 shows. The rate for first births was 104.6 and for second births 95.7; rates for the later orders rose rapidly, reaching the maximum of 181.5 for births of orders tenth and later. The tendency for the rate for first births to be slightly higher than that for second and for the rate to rise rapidly for the later orders is characteristic and is found in other statistics.[5] The infant mortality rates for orders under the fifth were below the average for all births, and those for orders fifth and later were above the average.

TABLE 27.—*Infant mortality rates, by cause of death and order of birth; live births in eight cities*

Order of birth	Live births	Infant deaths from specified causes											
		All causes		Gastric and intestinal diseases		Respiratory diseases		Early infancy		Epidemic and other communicable diseases		Other causes	
		Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates
Total	22,967	2,555	111.2	743	32.4	450	19.6	830	36.1	162	7.1	370	16.1
First	6,230	652	104.6	155	24.9	79	12.7	259	41.6	43	6.9	116	18.6
Second	4,954	474	95.7	138	27.9	87	17.6	152	30.7	26	5.2	71	14.3
Third	3,328	348	104.6	92	27.6	67	20.1	119	35.8	23	6.9	47	14.1
Fourth	2,481	270	108.8	82	33.1	68	27.4	69	27.8	15	6.0	36	14.5
Fifth	1,767	210	118.8	65	36.8	47	26.6	60	34.0	9	5.1	29	16.4
Sixth	1,263	155	122.7	56	44.3	25	19.8	44	34.8	11	8.7	19	15.0
Seventh	921	126	136.8	44	47.8	24	26.1	31	33.7	8	8.7	19	20.6
Eighth	677	92	135.9	33	48.7	17	25.1	27	39.9	7	10.3	8	11.8
Ninth	470	69	146.8	20	42.6	11	23.4	22	46.8	9	19.1	7	14.9
Tenth and later	876	159	181.5	58	66.2	25	28.5	47	53.7	11	12.6	18	20.5

[4] In determining classification the order of a birth was taken as one more than the number of previous births, including stillbirths (dead births of at least seven months' gestation) and in the case of births studied in Baltimore, or nearly half of those now under consideration, including also miscarriages. In the cases of twins or triplets both or all were classified as of the same order of birth.

[5] See, for example, Die Lehre von der Mortalität und Morbilität, by H. Westergaard (Second Edition), p. 364 (Jena, 1901).

Causes of death.

A marked contrast in the trend of the infant mortality rates for the several orders appears in Table 27 between causes peculiar to early infancy and the two other major groups, gastric and intestinal and respiratory diseases. The mortality rate from causes peculiar to early infancy was especially high for first births—41.6 as compared with an average of 32.3 for births of orders second to seventh; only the ninth and the tenth and later orders had higher rates from these causes than the first. On the other hand, the rate of mortality from gastric and intestinal diseases was lower for first births than for any later order; this was true also of the rate from respiratory diseases. Evidently, therefore, the tendency for the first births to have a higher rate of mortality from all causes than the second births was due to their markedly less favorable rate from causes peculiar to early infancy, offset in part by their slightly more favorable rates from gastric and intestinal and from respiratory diseases.

Neonatal mortality.

The mortality during the first month was much higher among first births than among those of any other order up to the group tenth and later. (Table 28.) This trend follows closely that of the rates from causes peculiar to early infancy, a group of causes which contributed the bulk of the deaths during the first month.[6]

TABLE 28.—*Neonatal mortality rates, by order of birth; live births in eight cities*

Order of birth	Live births	Deaths under 1 month	Neonatal mortality rates	Order of birth	Live births	Deaths under 1 month	Neonatal mortality rates
Total	22,967	1,028	44.8	Fifth	1,767	71	40.2
				Sixth	1,263	50	39.6
First	6,230	334	53.6	Seventh	921	37	40.2
Second	4,954	194	39.2	Eighth	677	33	48.7
Third	3,328	138	41.5	Ninth	470	22	46.8
Fourth	2,481	89	35.9	Tenth and later	876	60	68.5

Age of mother.

The order of birth is, of course, closely related to the age of the mother. Seven-tenths of the first births but none of those tenth or later in order were to mothers under 25 years of age. On the other hand, only 8.5 per cent of the first births but 56.9 per cent of the fifth births and 99 per cent of the births tenth or later in order were to mothers 30 years of age or over. (See General Table 15, p. 192.)

It has already been shown that the mortality rates were higher than average for infants of mothers under 20. Therefore the high proportion of infants of young mothers in the group of first births would tend to account for the high mortality rate for these births; but this tendency was in part offset by the low proportion among first births of infants of mothers 35 years of age and over, for whom also mortality rates were high. Similarly, the high proportion in the group of births tenth and later in order, of infants of mothers 35 years of age and over would tend to account for the high mortality rate for these births, but this influence was in part offset by a low proportion in this group of births to mothers under 20 years of age.

[6] For monthly death rates in later months see General Table 26, p. 197.

The variation in the percentages of births to mothers of ages associated with higher than average infant mortality rates is shown in Table 29 for each order of birth.

TABLE 29.—*Proportion of births to mothers under 20 and to those 35 years of age and over, by order of birth; live births in eight cities*

Order of birth	Live births—			Order of birth	Live births—		
	Total	To mothers under 20, and 35 years and over			Total	To mothers under 20, and 35 years and over	
		Number	Per cent			Number	Per cent
Total	22,967	5,230	22.8	Fifth	1,767	377	21.3
First	6,230	1,355	21.7	Sixth	1,263	411	32.5
Second	4,954	537	10.8	Seventh	921	421	45.7
Third	3,328	344	10.3	Eighth	677	380	56.1
Fourth	2,481	330	13.3	Ninth	470	322	68.5
				Tenth and later	876	753	86.0

The infant mortality rates shown in Table 17, by order of birth for each age-of-mother group, indicate that the influence of order varied with the age of the mother. Of births to mothers under 20 years of age, the rate was lowest for first and rose rapidly for second and third. Comparatively few infants of orders later than third were found in this group for obvious reasons. Even when two or three babies had been born to one of these very young mothers the intervals between them were usually short. Of births to mothers between 25 and 30 years of age, on the other hand, the rate for the first, while lower than that for the first infants of mothers under 20, was still considerably higher than the rates for the second and the third; the mortality increased with the orders and therefore with the probability of short interval. Of births to mothers 35 years of age and over the rate was markedly high for the first—almost as high as that for the first infants of mothers under 20—fell to a minimum for the third and fourth births, and rose for later orders.

When allowance was made for the interrelation between order of birth and age of mother, as the comparison given in Table 30 indicates, first births had a higher mortality than second, and the rate rose from second to tenth and later—but at a slightly less rapid rate of increase than when no allowance was made for age of mother.

TABLE 30.—*Relative mortality, by order of birth, when influence of age of mother is eliminated; live births in eight cities*

Order of birth	Infant deaths			Ratio of original rate to average (per cent)	Order of birth	Infant deaths			Ratio of original rate to average (per cent)
	Actual	Expected[1]	Ratio of actual to expected (per cent)			Actual	Expected[1]	Ratio of actual to expected (per cent)	
Total	2,555	2,555.1	100.0	100.0	Fifth	210	192.8	108.9	106.8
					Sixth	155	141.2	109.8	110.3
First	652	703.9	92.6	94.2	Seventh	126	106.3	118.5	123.0
Second	474	538.7	88.0	86.1	Eighth	92	79.9	115.1	122.2
Third	348	356.9	97.5	94.2	Ninth	69	57.2	120.6	132.0
Fourth	270	266.3	101.4	97.8	Tenth and later	159	111.9	142.1	163.2

[1] Expected at average rates for births in each age-of-mother group, irrespective of order of birth.

Interval since preceding birth.

The proportion of births following preceding births at short intervals is shown in Table 31 for each order after the first.[7]

The proportion of short-interval births was higher—29.6 per cent—in the group of second births than in that of any later order up to tenth and later, for which it was 30.6 per cent. The fifth order had the lowest proportion of short-interval births (21.3 per cent).

In spite of the relatively high proportion of short-interval births among births second in order, this order had a lower infant mortality rate than any other. It is not surprising, therefore, to find that, when allowance was made for the slightly greater prevalence of short intervals among the second births and among those of high orders, the increasing trend of the mortality rate by order of birth was not materially altered. (Table 32.)

TABLE 31.—*Interval since preceding birth, by order of birth; live births in Baltimore second and later in order*

Order of birth	Live births second and later in order—			Order of birth	Live births second and later in order—		
	Total	Following preceding births at short intervals [1]			Total	Following preceding births at short intervals [1]	
		Number	Per cent			Number	Per cent
Total	7,929	2,072	26.1	Sixth	631	139	22.0
Second	2,409	712	29.6	Seventh	440	118	26.8
Third	1,481	387	26.1	Eighth	337	83	24.6
Fourth	1,127	256	22.7	Ninth	239	66	27.6
Fifth	818	174	21.3	Tenth and later	447	137	30.6

[1] For definition of interval see p. 60.

Age of mother and interval since preceding birth.

A much more marked interrelation was found between order of birth and interval since preceding birth when age of mother was taken into consideration than when age of mother was disregarded. Of the second births to mothers under 20 years of age 55.3 per cent occurred after short intervals, as compared with only 21.2 per cent of those to mothers between 25 and 30; of the third births to mothers under 20 years of age 88.5 per cent occurred after short intervals, as compared with 38.7 per cent of those to mothers between 20 and 25 and with 22.7 per cent of those to mothers between 25 and 30. Even among the births of relatively high orders marked differences in the proportions of short-interval births were found when different age-of-mother groups were compared. Thus of sixth births the percentage that followed the preceding births by short intervals decreased from 36.3 for those of mothers between 25 and 30 to only 9.2 for those of mothers between 35 and 40. (See General Table 18, p. 194.)

When allowance was made for this interrelationship, as in Table 32, the excess mortality among the births of late orders was considerably reduced. Nevertheless, there was still evident a markedly greater mortality among births of later than among those of earlier orders.

[7] For explanation of classification of births according to interval since preceding birth see p. 60. Data relating to interval since preceding birth were obtained only for the births in Baltimore. For infants born at short intervals the mortality was higher than average. See discussion in next section, pp. 60–67.

TABLE 32.—*Relative mortality, by order of birth, when the influence of interval since preceding birth and when the influences of both interval since preceding birth and age of mother are eliminated; single live births in Baltimore second and later in order* [1]

Order of birth	Ratio of actual rate to average (per cent)	Ratio of actual to expected deaths—		Order of birth	Ratio of actual rate to average (per cent)	Ratio of actual to expected deaths—	
		At average rates for same interval (per cent)	At average rates for same interval and same age-of-mother group (per cent)			At average rates for same interval (per cent)	At average rates for same interval and same age-of-mother group (per cent)
Total	100.0	100.0	100.0	Fifth	101.5	103.9	108.6
				Sixth	96.5	98.3	99.7
Second	88.5	87.1	88.2	Seventh	111.3	111.1	102.8
Third	88.6	88.6	93.1	Eighth and later	145.0	143.0	123.9
Fourth	95.8	98.2	101.3				

[1] For number of deaths upon which these ratios are based see General Table 28, p. —.

Prematurity.

A slightly larger proportion of first births than of births of any later order were premature,[8] according to Table 33. This high proportion of premature births is doubtless associated with the high mortality among first babies from causes peculiar to early infancy.

Among the premature the mortality rate for first births was lower than that for any later order. Among the full-term births, on the other hand, the mortality rate, as Table 34 shows, was higher for first than for second infants. Evidently, therefore, the slightly higher mortality found among first as compared with second births can not be explained by the fact that the former group included a larger proportion of premature births. (Compare also General Table 27, p. 197.)

The higher proportion of premature in the group of first births tended, however, to neutralize the effect upon the infant mortality rates of later orders of a higher proportion of plural births in the births of those orders.

TABLE 33.—*Proportion of premature births, by order of birth; live births in eight cities*

Order of birth	Live births			Order of birth	Live births		
	Total	Premature			Total	Premature	
		Number	Per cent			Number	Per cent
Total	22,967	1,158	5.0	Fifth	1,767	54	3.1
				Sixth	1,263	45	3.6
First	6,230	457	7.3	Seventh	921	32	3.5
Second	4,954	246	5.0	Eighth	677	31	4.6
Third	3,328	135	4.1	Ninth	470	25	5.3
Fourth	2,481	93	3.7	Tenth and later	876	40	4.6

[8] Westergaard gives figures showing that the proportion of premature is greater among first births than among births of later orders. See Die Lehre von der Mortalität und Morbilität (Second Edition), p. 337.

TABLE 34.—*Relative mortality, by order of birth, for full-term and for all births; live births in eight cities*

Order of birth	Infant mortality rates			Order of birth	Infant mortality rates		
	All births	Full term			All births	Full term	
	Ratio to average rate (per cent)	Infant mortality rates	Ratio to average rate (per cent)		Ratio to average rate (per cent)	Infant mortality rates	Ratio to average rate (per cent)
Total	100.0	88.4	100.0	Fifth	106.8	101.0	114.3
First	94.2	76.4	86.4	Sixth	110.3	101.8	115.2
Second	86.1	70.5	79.8	Seventh	123.0	121.5	137.4
Third	94.1	86.1	97.4	Eighth	122.2	109.9	124.3
Fourth	97.8	91.7	103.7	Ninth	132.0	123.6	139.8
				Tenth and later	163.2	156.7	177.3

Plural births.

The proportion of twins and triplets tended to increase slightly with the number in order of birth. Plural births formed only 1.5 per cent of the first and 2 per cent of the second births, while of those tenth and later in order they constituted 3.6 per cent. (Table 35.) Since the mortality among plural births was unusually heavy, as will be shown later, the slightly greater prevalence of twins and triplets among infants of later orders accounts for a small part of the high mortality in these orders. That it accounted for only a small part of this high mortality is shown by the fact, appearing in Table 36, that, though the rates for single births were all slightly lower, this trend was substantially the same as that exhibited by the rates for all infants. The elimination of the plural births made the rate for tenth and later orders appear slightly less excessive than when all infants were included.

TABLE 35.—*Proportion of plural births, by order of birth; live births in eight cities*

Order of birth	Live births			Order of birth	Live births		
	Total	Plural			Total	Plural	
		Number	Per 1,000			Number	Per 1,000
Total	22,967	529	23.0	Fifth	1,767	50	28.3
First	6,230	95	15.2	Sixth	1,263	53	42.0
Second	4,954	99	20.0	Seventh	921	24	26.1
Third	3,328	95	28.5	Eighth	677	13	19.2
Fourth	2,481	60	24.2	Ninth	470	8	17.0
				Tenth and later	876	32	36.5

96515°—25†——5

TABLE 36.—*Relative infant mortality rates, by order of birth; single and all live births in eight cities*

Order of birth	Infant mortality rates				Order of birth	Infant mortality rates			
	All births		Single births			All births		Single births	
	Rate	Ratio to average rate (per cent)	Rate	Ratio to average rate (per cent)		Rate	Ratio to average rate (per cent)	Rate	Ratio to average rate (per cent)
Total	111.2	100.0	105.3	100.0	Fifth	118.8	106.8	109.5	104.0
					Sixth	122.7	110.3	109.1	103.6
First	104.7	94.2	100.7	95.6	Seventh	136.8	123.0	134.9	128.1
Second	95.7	86.1	90.8	86.2	Eighth	135.9	122.2	128.0	121.6
Third	104.6	94.1	100.5	95.4	Ninth	146.8	132.0	138.5	131.5
Fourth	108.8	97.8	102.4	97.2	Tenth and later	181.5	163.2	167.0	158.6

Type of feeding.

Slight variations in type of feeding were found between births of different orders. (See General Table 30, p. 198.) Thus of the infants surviving at the beginning of the third month 21.5 per cent of the first born were artificially fed—a percentage that exceeded that of any other order up to the group tenth and later, for which the percentage (30.5) was markedly high. The smallest proportion artificially fed at this age was found among third births. Of the infants surviving at the beginning of the sixth month the highest percentage artificially fed (37.1) was found among those who were tenth and later in order and the lowest (25.2) among the ninth in order; the proportion for the first born was midway between the two extremes (31.7). The high proportion of first and of tenth and later infants who were artificially fed may be due in small part to the slightly larger percentage of premature in the first and of twins and triplets in the tenth and later orders, since in both these groups, as will be shown later (pp. 75 and 80–81), the proportion artificially fed was high. These slight differences in the proportion of premature and plural births, however, can scarcely account for the differences in prevalence of artificial feeding in these order-of-birth groups.

The greater prevalence of artificial feeding among first than among second infants tended to produce a higher mortality among the former, especially from gastric and intestinal diseases. But for the first born the mortality rate from gastric and intestinal diseases was in fact lower than for infants of any other order. The high proportion artificially fed in the group of first-born infants tended, therefore, to lessen and obscure the advantage which they had over infants of later orders in the matter of liability to mortality from these diseases. The disadvantage due to the difference in type of feeding was not great, however; if the same proportion of first-born as of second-born infants had been artificially fed, at the average difference in mortality between breast fed and artificially fed the rate from all causes for the first born would have been reduced from 104.6 to 101.8. But this figure is still considerably above the rate from all causes (95.7) for second births.

The greater prevalence of artificial feeding among infants tenth and later in order than among those of earlier orders (third to fifth,

for example) tends to explain in part the greater mortality among the former. If the same proportion of the infants of the tenth and later orders had been artificially fed as of those of the third, fourth, and fifth, the rate of mortality for the former group would have been reduced from 181.5 to 165.6, a very considerable reduction.

The greater prevalence of artificial feeding among the first born and among infants of the tenth and later orders appeared to have been independent of the influence of age of mother, as Table 37 shows. The numbers artificially fed among first-born infants and among infants tenth and later in order of birth were much greater than the numbers expected on the basis of the proportions artificially fed among births to mothers of corresponding ages.

TABLE 37.—*Influence of order of birth upon the proportion of infants artificially fed during the third month of life, when influence of age of mother is eliminated; infants in eight cities*

Order of birth	Infants surviving at beginning of third month			Order of birth	Infants surviving at beginning of third month		
	Actual number artificially fed	Expected number artificially fed [1]	Ratio of actual to expected (per cent)		Actual number artificially fed	Expected number artificially fed [1]	Ratio of actual to expected (per cent)
Total	4,431	4,430.9	100.0	Fifth	325	345.8	94.0
				Sixth	234	254.0	92.1
First	1,259	1,161.0	108.4	Seventh	169	190.7	88.6
Second	948	933.3	101.6	Eighth	136	142.1	95.7
Third	580	628.8	92.2	Ninth	92	101.5	90.6
Fourth	444	477.3	93.0	Tenth and later	244	196.4	124.2

[1] Expected at average proportions artificially fed in each age-of-mother group.

Color and nationality of mother.

A considerably larger percentage of the births of orders for which the infant mortality rates were above average than of those of orders with low rates occurred to mothers belonging to race or nationality groups for which the infant mortality rates were above average. Table 38 shows, for example, that of the infants tenth and later in order 48.3 per cent, as compared with 25 per cent of the first born, were born to mothers of race or nationality groups which had high rates.

When allowance was made in Table 39 for this disproportionate weighting of the groups of infants of late orders with infants of nationality groups for which the mortality rates were high, the excess mortality associated with the high orders appeared to be somewhat diminished but was by no means eliminated. The characteristic upward trend of the rates with the advance in order of birth was still strikingly in evidence.

TABLE 38.—*Proportion of births to mothers of nationalities with high infant mortality rates, by order of birth; live births in eight cities*

Order of birth	Live births—			Order of birth	Live births—		
	Total	To mothers of nationalities with high infant mortality rates [1]			Total	To mothers of nationalities with high infant mortality rates [1]	
		Number	Per cent			Number	Per cent
Total	22,967	7,428	32.3	Fifth	1,767	688	38.9
First	6,230	1,557	25.0	Sixth	1,263	489	38.7
Second	4,954	1,393	28.1	Seventh	921	381	41.4
Third	3,328	1,091	32.8	Eighth	677	299	44.2
Fourth	2,481	908	36.6	Ninth	470	199	42.3
				Tenth and later	876	423	48.3

[1] Includes French-Canadian, Polish, Portuguese, "other foreign born," and colored. For basic figures see General Table 31, p. 198.

TABLE 39.—*Relative mortality, by order of birth, when influence of color and nationality of mother is eliminated; live births in eight cities*

Order of birth	Infant deaths			Order of birth	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)		Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,555	2,555.0	100.0	Fifth	210	203.0	103.4
First	652	665.3	98.0	Sixth	155	145.1	106.8
Second	474	536.7	88.3	Seventh	126	107.4	117.3
Third	348	369.0	94.3	Eighth	92	80.3	114.6
Fourth	270	283.2	95.3	Ninth	69	55.4	124.6
				Tenth and later	159	109.6	145.1

[1] Expected at average rates for infants in each color and nationality group, irrespective of order of birth.

Earnings of father.

A much larger proportion of the births of later orders than of the first or second births occurred in families in which the fathers' earnings were low. Table 40 shows that nearly two-fifths of the tenth and later as compared with little more than one-fifth of the first births occurred in families in which the fathers earned less than $550; and twice as large a proportion of the first and second as of the tenth and later births occurred in families in which the fathers earned $1,250 or over. Since low father's earnings, as will be shown later, were associated with high infant mortality rates, the correlation between late order of birth and low father's earnings might have accounted for part or all of the high infant mortality rates associated with late order of birth.

When the influence of this correlation between earnings of father and order of birth was eliminated in Table 41, however, the effect of order of birth appeared to be slightly diminished but by no means eliminated. In other words, after account was taken of the influence of father's earnings the mortality rates for the different orders of birth showed the same trend, though the increase in the rates for the later births was somewhat less marked.

TABLE 40.—*Earnings of father, by order of birth; live births in seven cities* [1]

Order of birth	Live births				
	Total	Earnings of father			
		Under $550		$1,250 and over	
		Number	Per cent	Number	Per cent
Total	21,536	5,910	27.4	2,252	10.5
First	5,908	1,296	21.9	697	11.8
Second	4,681	1,156	24.7	590	12.6
Third	3,115	838	26.9	335	10.8
Fourth	2,302	703	30.5	222	9.6
Fifth	1,632	522	32.0	127	7.8
Sixth	1,172	378	32.3	107	9.1
Seventh	847	309	36.5	55	6.5
Eighth	622	220	35.4	45	7.2
Ninth	437	161	36.8	27	6.2
Tenth and later	820	327	39.9	47	5.7

[1] For basic figures see General Table 32, p. 199.

TABLE 41.—*Relative mortality, by order of birth, when influence of earnings of father is eliminated; live births in seven cities*

Order of birth	Infant deaths			Order of birth	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)		Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,368	2,368.0	100.0	Fifth	194	186.5	104.0
				Sixth	141	134.7	104.7
First	617	624.4	98.8	Seventh	113	99.0	114.1
Second	440	500.8	87.9	Eighth	82	73.0	112.3
Third	315	339.8	92.7	Ninth	66	52.6	125.4
Fourth	252	258.6	97.4	Tenth and later	148	98.5	150.3

[1] Expected if the average rates of mortality in each earnings group had prevailed among the births of the same earnings group for each order of birth.

This comparison, it must be conceded, does not give full weight to the effects of economic factors in producing greater mortality among the births of late orders, for a large number of previous births is usually associated with a large family, and the same earnings will not go so far with a large as with a small family. A correlation with income per unit of family would give a more satisfactory basis for determining the influence of economic factors over the infant mortality rates for the different orders of birth.

Per capita earnings.

The marked relation which existed between later orders and low per capita earnings [9] is shown in Table 42. Of the tenth and later births, over seven times as large a proportion as of first births—90.5 per cent, as compared with 12 per cent—occurred in families in which the per capita income from the father's earnings was less than $200.

[9] Per capita income from father's earnings only. See discussion, pp. 149–150.

TABLE 42.—*Proportion of births in families with per capita income from father's earnings of less than $200, by order of birth; live births in seven cities*

Order of birth	Live births—			Order of birth	Live births—		
	Total	In families with per capita income of less than $200 [1]			Total	In families with per capita income of less than $200 [1]	
		Number	Per cent			Number	Per cent
Total	21,536	10,388	48.2	Fifth	1,632	1,323	81.1
				Sixth	1,172	989	84.4
First	5,908	707	12.0	Seventh	847	759	89.6
Second	4,681	1,558	33.3	Eighth	622	551	88.6
Third	3,115	1,676	53.8	Ninth	437	394	90.2
Fourth	2,302	1,689	73.4	Tenth and later	820	742	90.5

[1] Income from earnings of father only. For explanation of classification see pp. 148–149. The father's earnings group $1,250 and over was not included in the classification by per capita income. For basic figures see General Tables 32 and 33, p. 199.

In Table 43 a partial allowance was made for the association between late orders and low per capita income from father's earnings which was found to characterize large families. The correction was a somewhat crude one, since, for want of detailed data on age and sex, the income from father's earnings was considered to have been distributed equally among all members of the family irrespective of their relative requirements. This procedure introduced, in effect, a classification according to the number of persons in the family—a classification which paralleled that by order of birth more closely than was desirable in an analysis designed to distinguish the influence of order of birth from that of economic need as measured by family requirements.

In view of this difficulty it was surprising to find that the characteristic variations in the infant death rates by order of birth remained. The mortality among the first born appeared much larger relatively to that among later infants than when no allowance was made for the greater requirements of the larger families; and that among second, third, and fourth babies appeared much lower relatively to that among the first born and also to that among fifth and later infants. On the other hand, the rates for infants of late orders were not markedly above the average until the groups ninth and tenth and later were reached. Among fifth and later infants the mortality was considerably higher than that prevailing among those who were second to fourth in order.

The correlation between late orders and large families seemed, therefore, to account for a considerable part of the excess mortality found among births of late orders, although a more careful measurement of economic need than the present tabulations permit would be required to prove this conclusion.

TABLE 43.—*Infant mortality rates, by order of birth, when influence of differences in per capita income from father's earnings is eliminated; live births in seven cities*

Order of birth	Infant deaths			Order of birth	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)		Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,368	2,367.8	100.0	Fifth	194	200.3	96.8
First	617	555.3	111.1	Sixth	141	146.7	96.1
Second	440	477.7	92.1	Seventh	113	110.5	102.3
Third	315	343.3	91.8	Eighth	82	82.8	99.0
Fourth	252	270.9	93.0	Ninth	66	61.3	107.7
				Tenth and later	148	119.0	124.4

[1] Expected at average rates for the per capita income group for infants of fathers earning less than $1,250; and for other infants at average rates for their groups—that is, earnings of $1,250 and over, no earnings, and earnings not reported. See discussion, p. 148.

Summary.

The analysis by cause of death shows that the first births were handicapped, as compared with those of later orders, by a high mortality from causes peculiar to early infancy. This mortality was associated with a large proportion of premature births, but the disproportionate number of such births was not alone sufficient to account for the high rate found for the first born. Some physical handicap seems, therefore, to have affected first infants.

Once the first born had survived for a few weeks, however, they had death rates that were lower than those of any later order. In particular the mortality from gastric and intestinal diseases and from respiratory diseases was lower among first infants than among those of any other order. These low rates existed in spite of a slightly greater prevalence of artificial feeding among first as compared with second infants.

Leaving the first born out of account, the infant mortality rates from all causes and from each of the principal causes showed a tendency to increase with the order of birth. Analysis shows that intercorrelations with other factors explain part, but not all, of this tendency. When allowances were made for age of mother and for interval since preceding birth the excess mortality among the infants of late orders, as compared with second or third babies, appeared slightly less marked.

The greater prevalence of artificial feeding among tenth and later infants accounted in part for their excess mortality. Although the age of the mother was also a factor, this tendency toward artificial feeding appeared to be associated, through an increasing inability of the mothers to give their babies breast feeding, with the advancing order of birth.

When allowance was made for the correlation between order of birth and birth in nationality groups which had high rates of mortality, the tendency toward a rise in the rates as the order of birth advanced was still apparent though slightly less marked than when no such allowance was made.

The correction for the correlation between late orders of birth and low father's earnings likewise lessened slightly the tendency toward a rise in the rates as the order advanced. When further allowance was made for the varying sizes of the families for the requirements of which the earnings had to be used, the excess mortality among the later infants as compared with the average for all orders seemed largely to disappear; but there still remained a markedly more favorable rate for the second, third, and fourth babies than for the first born and those fifth and later in order. The mortality among the babies of late orders still remained higher than that among the second, third, and fourth infants.

A final conclusion is somewhat difficult to draw, since the data available are too limited to justify an analysis by all factors together. To some extent, moreover, these different factors overlap. The analysis by age of mother and interval since preceding birth, for example, takes care of the economic factors so far as they produced their effects through a greater birth frequency. As will be shown later, certain of the marked differences in rates between the infants of the various nationality groups were a reflection of differences in earnings and appear to have been to a relatively slight degree due to differences in racial vitality or in customs and traditions. The conclusion may therefore be ventured that even if full allowance were made for all the correlated elements a markedly greater mortality would be found among births of later than among those of earlier orders.

INTERVAL SINCE PRECEDING BIRTH

For all except first infants the length of time that has elapsed since the next preceding birth may influence the chances of life. In the present study this interval was measured in approximate terms only—by the difference in even years between the mother's age at the time of birth of the scheduled child and her age at the time of the preceding birth.[10]

The analysis given in Table 44 shows that the infants who were born after the shortest intervals—i. e., after changes of only one year in their mothers' ages [10]—since next preceding births to their mothers had the highest mortality rate (146.7) and those who were born after changes of four or more years had the lowest (84.9). The most marked difference appeared between the rates for infants who were born after changes of one year and after changes of two years, which were 146.7 and 98.6, respectively. Practically no difference was found between the mortality of infants born after changes of three and of four or more years, the rates for these groups being 86.5 and 84.9, respectively.

[10] The only information obtained in regard to interval was the mothers' ages expressed in even years at successive births. The interval groups into which the data were analyzed were those in which the change in the mother's age was one year (including a few cases in which the mother's age did not change), two years, three years, and four or more years—groups for which the average intervals since the preceding births were slightly over one year, approximately two years and three years, and more than four years. The data relating to interval are limited to one city, Baltimore.

TABLE 44.—*Infant mortality rates, by cause of death and interval since preceding birth;* [1] *live births in Baltimore*

Interval since preceding birth [1]	Live births	Infant deaths from specified causes									
		Total	Infant mortality rates [2]	Gastric and intestinal diseases		Respiratory diseases		Early infancy		Other causes	
				Number	Infant mortality rates [2]	Number	Infant mortality rates [2]	Number	Infant mortality rates [2]	Number	Infant mortality rates [2]
Total	10,797	1,117	103.5	314	29.1	213	19.7	407	37.7	183	16.9
First births	2,868	272	94.8	67	23.4	42	14.6	111	38.7	52	18.1
Second and later births	7,929	845	106.6	247	31.2	171	21.6	296	37.3	131	16.5
Interval 1 year	2,072	304	146.7	106	51.2	57	27.5	96	46.3	45	21.7
Interval 2 years	2,950	291	98.6	90	30.5	58	19.7	103	34.9	40	13.6
Interval 3 years	1,364	118	86.5	25	18.3	28	20.5	42	30.8	23	16.9
Interval 4 years and over	1,496	127	84.9	25	16.7	28	18.7	52	34.8	22	14.7
Interval not reported	47	5	-------	1	-------	-------	-------	3	-------	1	-------

[1] For definition of interval see p. 60.
[2] Not shown where base is less than 100.

Causes of death.

Table 44 also shows that the trend of the rates from each of the three principal groups of causes—those peculiar to early infancy, gastric and intestinal diseases, and respiratory diseases—was similar to that of the rates from all causes; in each case the infants whose births occurred after short intervals (one year's change in mother's age) had a markedly higher rate than those born after longer intervals. For the one-year group, the mortality rate from causes peculiar to early infancy was 46.3, as compared with 34.9 for the two-year group and with 30.8 and 34.8 for the three and the four or more year groups, respectively. The mortality from gastric and intestinal diseases among the infants born after short intervals was 51.2, as compared with 30.5 for those whose births followed intervals which averaged about two years and with only 16.7 for those born after intervals which averaged four years or more. From respiratory diseases the rate for infants born after changes of only one year in their mother's ages since preceding births was 27.5, which was higher than the rates for infants born after changes of two, three, and four or more years—19.7, 20.5, and 18.7, respectively. The mortality rate from all other causes was decidedly higher for the short-interval infants (21.7) than for other infants.

Neonatal mortality.

Furthermore, a markedly higher rate of mortality during the first month [11] was found among the short-interval group than among infants born after intervals averaging about two, three, or four years or more—51.2, as compared with 37.3, 36.7, and 38.1, respectively. (Table 45.)

[11] For rates in later months see General Table 34, p. 199.

Age of mother and order of birth.

A markedly smaller proportion of the infants born after short intervals since preceding births than of those born after longer intervals, according to Table 46, were born to mothers under 20 years and mothers 35 years of age and over—that is, belonged to age-of-mother groups with higher than average infant mortality rates. Evidently, therefore, the effect of this disproportionate weighting of the longer-interval groups with births in age-of-mother groups which had high rates tended to raise the mortality among the longer-interval groups, as compared with that among the short-interval groups, and thus to counteract in part the influence of short intervals in causing a high death rate.

TABLE 45.—*Neonatal mortality rates, by interval since preceding birth;* [1] *live births in Baltimore*

Interval since preceding birth [1]	Live births	Deaths under 1 month	Neonatal mortality rates [2]
Total	10,797	477	44.2
First births	2,868	150	52.3
Second and later births	7,929	327	41.2
Interval 1 year	2,072	106	51.2
Interval 2 years	2,930	110	37.3
Interval 3 years	1,364	50	36.7
Interval 4 years and over	1,496	57	38.1
Interval not reported	47	4	

[1] For definition of interval see p. 60.
[2] Not shown where base is less than 100.

TABLE 46.—*Proportion of births to mothers under 20 and to those 35 years of age and over, by interval since preceding birth;* [1] *single live births in Baltimore*

Interval since preceding birth [1]	Single live births—		
	Total	To mothers under 20 and those 35 years of age and over	
		Number	Per cent [2]
Total	10,537	2,503	23.8
First births	2,830	762	26.9
Second and later births	7,707	1,741	22.6
Interval 1 year	2,026	374	18.5
Interval 2 years	2,867	570	19.9
Interval 3 years	1,316	315	23.9
Interval 4 years and over	1,451	467	32.2
Interval not reported	47	15	

[1] For definition of interval see p. 60.
[2] Not shown where base is less than 100.

TABLE 47.—*Proportion of births of orders seventh and later in order, by interval since preceding birth;* [1] *single live births in Baltimore second and later in order*

Interval since preceding birth [1]	Single live births second and later in order—		
	Total	Of orders seventh and later	
		Number	Per cent [2]
Total	7,707	1,414	18.3
One year	2,026	389	19.2
Two years	2,867	544	19.0
Three years	1,316	253	19.2
Four years and over	1,451	207	14.3
Not reported	47	21	----

[1] For definition of interval see p. 60.
[2] Not shown where base is less than 100.

So far as the correlation between interval and order of birth is concerned, Table 47 shows that except for the infants who were born after the longest intervals the percentages of infants of orders seventh and later were practically the same for each interval group. So far, therefore, as any correlation with age of mother on the one hand and order of birth on the other is concerned, neither of these factors could have changed the trend of the mortality rates by interval. The high mortality found among infants born after short intervals since preceding births is not to be ascribed, in other words, either to the influence of order of birth or to that of mother's age.

Prematurity.

A considerably larger proportion (6.4 per cent) of the short-interval births than of any other group were premature. The smallest proportion of premature births—3.6 per cent—was found among births which followed intervals of about two years; in the four or more year group the proportion of premature births was 4.6 per cent. It is interesting to note also in Table 48 that even in the short-interval group the proportion of premature births was less than that among first births. (See also General Table 35, p. 200.)

Plural births.

The differences in the proportions of twins and triplets in the different interval groups, as shown in Table 49, were relatively slight. The proportion was smallest for the short-interval births, 2.2 per cent of which were plural (even this figure was higher than that for first births), and rose to 3.5 per cent for infants born after intervals of three years.

TABLE 48.—*Proportion of premature births, by interval since preceding birth;*[1] *live births in Baltimore*

Interval since preceding birth [1]	Live births		
	Total	Premature births	
		Number	Per cent [2]
Total	10,797	591	5.5
First births	2,868	230	8.0
Second and later births	7,929	361	4.6
Interval 1 year	2,072	132	6.4
Interval 2 years	2,950	105	3.6
Interval 3 years	1,364	50	3.7
Interval 4 years and over	1,496	69	4.6
Interval not reported	47	5	----

[1] For definition of interval see p. 60. [2] Not shown where base is less than 100.

TABLE 49.—*Proportion of plural births, by interval since preceding birth;* [1] *live births in Baltimore*

Interval since preceding birth [1]	Live births		
	Total	Plural births	
		Number	Per cent
Total	10,797	260	2.4
First births	2,868	38	1.3
Second and later births	7,929	222	2.8
Interval 1 year	2,072	46	2.2
Interval 2 years	2,950	83	2.8
Interval 3 years	1,364	48	3.5
Interval 4 years and over	1,496	45	3.0
Interval not reported	47	----	----

[1] For definition of interval see p. 60.

Type of feeding.

A markedly larger proportion of infants who were born after changes of only one year in their mothers' ages since the next preceding birth were artificially fed than of infants born after longer intervals. Of infants surviving at the beginning of the third month 24.1 per cent of the one-year as compared with 15.5 per cent of the two-year group were artificially fed. (See General Table 36, p. 200.) This difference in the prevalence of artificial feeding was manifest throughout the first nine months of life, the percentage artificially fed being nearly 10 points higher in the third, sixth, and ninth months, for example, for the infants born after short intervals than for those whose birth followed intervals averaging about two years.

The greater prevalence of artificial feeding among infants born at short intervals after preceding births can account only in part, however, for their markedly heavy mortality rate; if the same percentage of these infants as of those born at intervals averaging about two years had been artificially fed, then the reduction in mortality due to the difference in the rates between artificially-fed and breast-fed infants would have been only from 146.7 to 133.2.

Color and nationality of mother.

A somewhat larger proportion of short-interval than of other births were to colored mothers or mothers of nationalities having infant mortality rates higher than average, according to figures shown in Table 50. This higher proportion, however, as shown in Table 51, accounts for only a small part of the excess mortality among infants of the short-interval group. When the influence of nationality was eliminated, the comparison of the rates for the one-year and the four year or more groups became the ratio 132 to 84.8 instead of the ratio 137.6 to 79.6. In other words, after allowance was made for the influence of nationality the relative mortality among the infants of short-interval birth was only 1.6 times that among infants born after intervals of four or more years, as compared with 1.7 times when no such allowance was made. The effect of differences in the proportions of the different nationalities in the several interval groups was evidently slight.

TABLE 50.—*Proportion of births to mothers of nationalities with high infant mortality rates, by interval since preceding birth;* [1] *live births in Baltimore second and later in order*

Interval since preceding birth [1]	Live births second and later in order—			Interval since preceding birth [1]	Live births second and later in order—		
	Total	To mothers of nationalities with high infant mortality rates [2]			Total	To mothers of nationalities with high infant mortality rates [2]	
		Number	Per cent			Number	Per cent
Total	7,929	1,912	24.1	Three years	1,364	293	21.5
One year	2,072	594	28.7	Four years and over	1,496	254	17.0
Two years	2,950	757	25.7	Not reported	47	14	29.8

[1] For definition of interval see p. 60.
[2] Includes Polish, "other foreign born," and colored. For basic figures see General Table 37, p. 200.

TABLE 51.—*Relative mortality, by interval since preceding birth,* [1] *when influence of nationality is eliminated; live births in Baltimore second and later in order*

Interval since preceding birth [1]	Infant deaths			Interval since preceding birth [1]	Infant deaths		
	Actual	Expected [2]	Ratio of actual to expected (per cent)		Actual	Expected [2]	Ratio of actual to expected (per cent)
Total	845	845.1	100.0	Three years	118	142.5	82.8
One year	304	230.3	132.0	Four years and over	127	149.7	84.8
Two years	291	317.5	91.7	Not reported	5	5.1	----------

[1] For definition of interval see p. 60.
[2] Expected if the average mortality rate for births second and later in order for each nationality had prevailed irrespective of interval since preceding birth.

Earnings of father.

The correlation between father's earnings and the prevalence of short-interval births is shown in Table 52. The differences in the proportions of births by intervals in families in which the fathers earned less than $650—families in which infant mortality was above average—were not great, the percentages for births in the one, two, and three year groups being 48.7, 47.2, and 45.8, respectively. For the four or more year group, however, the percentage dropped to 36.8. If allowance were made, therefore, for the smaller proportion of infants born in families with low earnings, among the infants born after the longest intervals, the infant mortality rate for these infants would be slightly raised. As was the case with the allowance for differences in nationality, however, such an allowance for differences in economic status is shown in Table 53 to have relatively little effect upon the high mortality among the infants born after short intervals.[12]

TABLE 52.—*Proportion of births in families in which the father earned less than $650, by interval since preceding birth;* [1] *live births in Baltimore* [2]

Interval since preceding birth [1]	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent [3]
Total	10,797	4,689	43.4
First births	2,868	1,088	37.9
Second and later births	7,929	3,601	45.4
Interval 1 year	2,072	1,010	48.7
Interval 2 years	2,950	1,393	47.2
Interval 3 years	1,364	625	45.8
Interval 4 years and over	1,496	551	36.8
Interval not reported	47	22	

[1] For definition of interval see p. 60.
[2] For basic figures see General Table 38, p. 201.
[3] Not shown where base is less than 100.

TABLE 53.—*Relative mortality, by interval since preceding birth,* [a] *when influence of earnings of father is eliminated; live births in Baltimore second and later in order*

Interval since preceding birth [a]	Infant deaths			Ratio of original rate to average (per cent) [c]	Interval since preceding birth [a]	Infant deaths			Ratio of original rate to average (per cent) [c]
	Actual	Expected [b]	Ratio of actual to expected (per cent) [c]			Actual	Expected [b]	Ratio of actual to expected (per cent) [c]	
Total	845	845.0	100.0	100.0	Three years	118	146.1	80.8	81.1
One year	304	226.5	134.2	137.6	Four years and over	127	149.5	84.9	79.6
Two years	291	317.8	91.6	92.5	Not reported	5	5.1		

[a] For definition of interval see p. 60.
[b] Expected at average rates in each earnings group, irrespective of interval since preceding birth.
[c] Not shown where base is less than 100.

[12] For correlation with per capita earnings see General Table 39, p. 201.

Summary.

The infants born after short intervals had a markedly high rate of mortality from all causes, from causes peculiar to early infancy, from respiratory diseases, and from gastric and intestinal diseases. Though certain other factors—premature birth, plural birth, order of birth, and age of mother—were to a slight degree correlated with short-interval birth, these factors do not account for this excess mortality. When allowance was made for the slightly greater prevalence in the short-interval group of infants of nationalities with high mortality rates and of infants born in families in which the father's earnings were low, the relative mortality of the group appeared to be only very slightly reduced. The greater prevalence of artificial feeding in the short-interval group accounts in part, but by no means entirely, for its relatively high death rate. Apart from all these factors the short-interval infants had a markedly higher mortality than other infants. Evidently some factor that is intimately connected with the short interval—perhaps through the influence of frequent births upon the mother's health—affected adversely the chances of life of the infants who followed closely after preceding births.

INTERVAL BEFORE SUCCEEDING PREGNANCY

An interval of less than one year between the birth of one child and the commencement of a succeeding pregnancy may exert an influence upon the earlier child's chances of reaching his first birthday, especially if the commencement of the succeeding pregnancy is followed by early weaning.

According to Table 54, in 11.4 per cent of the total number of cases of live births the mother became pregnant during the infant's life and before he had passed his first birthday. The proportion of months lived, however, by infants after their mothers had become pregnant was much smaller, only 4.7 per cent. The possible contribution of this factor to the general infant mortality rate was therefore comparatively slight. Data on interval between birth of infant and succeeding pregnancy were obtained only for the births in Baltimore.

TABLE 54.—*Proportion of births to mothers who became pregnant during first year of infant's life, and of months lived by infants between beginning of the subsequent pregnancy and end of their first year; infants in Baltimore*

Condition of mother during first year of infant's life	Live births		Months lived [1]
	Number	Per cent distribution	Per cent distribution
Total	10,797	100.0	100.0
Mother pregnant	[2] 1,232	11.4	4.7
Mother not pregnant	[3] 9,565	88.6	95.3

[1] The total number of months lived by all these infants from birth to the end of the first year was 120,161; of these, 5,706.5, or 4.7 per cent, were lived by infants after their mothers had become pregnant, and 114,454.5, or 95.3 per cent, were lived by infants whose mothers did not become pregnant during their first year and by infants before their mothers became pregnant.

[2] Sixty cases in which the mother became pregnant and the infant survived the year but for which the month when the mother became pregnant was not known are included in column 1, but the months lived after the mother became pregnant could not be included in column 3. For months in which the mother became pregnant see General Table 40, p. 201.

[3] Including 300 infants who died before their mothers became pregnant but whose mothers became pregnant within one year after infants' birth; 5 cases for which it was not reported whether the mother became pregnant before or after the infant died; and 28 cases in which the mother became pregnant in the same month in which the infant died.

During the 5,706.5 months lived by infants after their mothers became pregnant and before they reached their first birthday 75 deaths occurred, giving an average monthly death rate of 13.1. Since these were largely months of the latter part of the infants' first year of life, this average monthly rate was evidently considerably higher than that for other infants of the same age. If the average mortality prevailing in each month had prevailed among these infants the deaths among them would have numbered only 27, or a little over one-third as many, as Table 55 shows. Even though the numbers are small, this difference indicates clearly that an unusual hazard to the infant was associated with the mother's closely succeeding pregnancy.

TABLE 55.—*Relative mortality among infants of mothers who became pregnant during first year of infant's life, when effect of difference in infant's age and type of feeding is eliminated; infants in Baltimore*

Type of feeding	Infants of mothers becoming pregnant during first year of infant's life		
	Actual deaths	Expected deaths	
		On basis of average mortality	On basis of feeding reported
Total	75	27.0	48.3
Breast	3	----------	1.0
Partly breast	5	----------	1.5
Artificial	67	----------	45.8

Type of feeding.

A partial explanation of this excess mortality among the infants of mothers who became pregnant is found in the greater prevalence among them of artificial feeding. Of the months lived from the beginning of a subsequent pregnancy to the end of the ninth month of life by infants whose mothers became pregnant before that time, 78.7 per cent were months of artificial feeding, as compared with 23.3 per cent of all months lived to the end of the ninth by all infants. (See General Table 42, p. 202.) This greater prevalence of artificial feeding was due in part, it is true, to the fact that the months lived after the beginning of a succeeding pregnancy were largely months of late infancy during which artificial feeding was much more common than during earlier periods of life. But it was not by any means due wholly to this fact, for these infants were artificially fed in markedly larger proportions than other infants of the same ages. Thus of the infants whose mothers had previously become pregnant 81.2 per cent of those surviving at the beginning of the fifth and 81.9 per cent of those surviving at the beginning of the ninth month were artificially fed, as compared with 25.7 per cent and 31.9 per cent artificially fed, respectively, among all infants surviving at the beginning of the same months. (See General Table 43, p. 202.) Evidently an important factor in the excessive mortality among the infants whose mothers became pregnant during the first year of the infants' life, as Table 55 clearly shows, was the markedly greater tendency among them toward artificial feeding. The excess mortality among the artificially fed, as will be shown later in connection with the discussion of type of feeding, was greater the earlier the artificial feeding was commenced; among infants whose mothers became pregnant after the ninth month, it is doubtful whether the greater tendency toward artificial feeding produced any increase in the death rates.

Color and nationality of mother.

According to Table 56 a slightly larger proportion of the infants whose mothers became pregnant during the first year of the infants' life than of all other infants belonged to nationality groups having high mortality rates—31.7 per cent as compared with 24 per cent. (See also Table 93, p. 113.) This tendency toward a slight overweighting of the group with infants of nationalities having high rates would account in part for the excess mortality among the former.

Earnings of father.

A slightly larger proportion of infants whose mothers became pregnant during the infants' first year of life than of all other infants, according to figures given in Table 57, were born in families in which the father earned less than $650—51.8 per cent as compared with 42.4 per cent. (See also Table 140, p. 153.) The tendency to overweight this group with infants in the income groups having high mortality rates, like the overweighting of the group with infants of nationalities having high rates, also accounts in part for their excess mortality.

TABLE 56.—*Proportion of births to mothers of nationalities with high infant mortality rates, by pregnancy of mother during first year of infant's life; infants in Baltimore*

Condition of mother during first year of infant's life	Live births—		
	Total	To mothers of nationalities with high infant mortality rates [1]	
		Number	Per cent
Total	10,797	2,685	24.9
Mother pregnant	1,232	390	31.7
Mother not pregnant	9,565	2,295	24.0

[1] Includes Polish, "other foreign born," and colored.

TABLE 57.—*Proportion of infants born in families in which the father earned less than $650, by pregnancy of mother during first year of infant's life; infants in Baltimore*

Condition of mother during first year of infant's life	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	10,797	4,689	43.4
Mother pregnant	1,232	638	51.8
Mother not pregnant	9,565	4,051	42.4

Summary.

The mortality among infants whose mothers became pregnant during the infants' first year of life was over two and one-half times the average rate during corresponding months for all infants. This excess mortality was largely accounted for by the greater prevalence of artificial feeding but was due in part to the fact that the group included an undue proportion of infants of nationalities having high mortality rates as well as an undue proportion of those born in families with low incomes for which the infant mortality rates were markedly above average.

GENERAL SUMMARY

The influence of "birth frequency" is seen to have been of composite character, contributed to by four factors—age of mother, order of birth, interval since preceding birth, and interval before succeeding pregnancy.

Since the influence of "birth frequency" is of composite character, the relation between changes in the birth rate and the infant mortality rate depends upon the relation between changes in the birth rate and the separate factors into which it is analyzed. Thus a high birth rate commonly signifies early marriages, many births of high

orders, and short intervals between births; it is also found associated with low economic status. A low birth rate, on the other hand, usually means late marriages, relatively few births of high orders, and perhaps relatively longer intervals between births, and it is commonly associated with relatively high economic status. In order to test the true influence of a change of the birth rate upon infant mortality, definite information should be available showing to what degree the change in the rate is due to changes in the proportion of births to young mothers and to mothers 35 years of age and over, the proportion of births of late orders, and the proportion of short-interval births. Only with data on these points is it possible to distinguish between the influence attributable to differences in the birth rate per se and that due to differences in economic status or economic need, with which the birth rate is closely associated.

TYPE OF BIRTH

The points next to be considered are whether the birth occurred prematurely or at full term, whether it was single or plural, and whether the delivery was instrumental or normal. Other points of interest, such as type of operative delivery, can not be treated in this study because of the absence of the necessary data.

PREMATURITY

The infants reported to have been prematurely born numbered 1,158, constituting 5 per cent of the total number of live births. The period of gestation given on the birth certificate—or, if it was not given, then the period reported by the mother—was accepted; all births were classified as premature for which the number of months' gestation was stated as eight or less.

Of these prematurely born infants over half (626) died before the end of the first year of life, and the mortality rate was 540.6. This rate for the premature was over six times as high as that for the infants who were born at term (88.1).

Causes of death.

In Table 58 the rates of mortality from each of the principal groups of causes of death are shown for premature and for full-term infants. The excessive mortality among the premature appears to have been due largely to causes peculiar to early infancy. The rate from this group of causes was nearly 25 times as high among the premature as among the full-term infants. Deaths from malformations, also, were extremely prevalent among the prematurely born. From all other causes together the mortality among the premature averaged one and three-fourths times as high as that among the full-term infants.

TABLE 58.—*Infant mortality rates, by cause of death and term; live births in eight cities*[1]

Cause of death	Full-term births		Premature births	
	Deaths	Infant mortality rates	Deaths	Infant mortality rates
All causes	1,917	88.1	626	540.6
Gastric and intestinal diseases	689	31.7	51	44.0
Respiratory diseases	414	19.0	34	29.4
Malformations	79	3.6	20	17.3
Early infancy	356	16.4	469	405.0
Epidemic and other communicable diseases	144	6.6	17	14.7
External causes	13	.6	1	.9
Diseases ill defined and unknown	47	2.2	10	8.6
Other causes	175	8.0	24	20.7

[1] For figures showing causes of death in detail see General Table 44, p. 203.

Neonatal mortality.

The neonatal mortality rate for premature infants was very high, as would be expected from their high mortality from causes peculiar to early infancy. Of the 1,158 premature infants 510 died within the first month, and their neonatal mortality rate was 440.4 as compared with only 23.8 for the full-term infants. (See General Table 45, p. 203.)

Plural births.

Of the premature births 10.5 per cent were plural, as compared with only 1.9 per cent of the full-term births. Since twins and triplets had a very high mortality, this markedly larger proportion of plural births in the group of premature than in that of full-term infants increased decidedly the death rate of the prematurely born. The mortality rate among the premature infants was 6.14 times that among the full-term infants, as Table 59 shows. But when the actual deaths among the prematurely born were compared with the deaths expected at the rates prevailing among the full-term single and full-term plural infants, respectively, it appeared that the mortality among the premature was only 5.13 times as high as that among the full-term births. The correction for the greater proportion of plural among the premature thus reduced the ratio between the mortality rates by one-sixth.

For the single births alone the mortality among the premature was 6.3 times that among the full-term births; but for the twins and triplets, for whom the fact of plural birth seems to have exerted a markedly adverse influence, the mortality among the premature was only a little over twice as high as that among the full-term births.

TABLE 59.—*Relative mortality among premature and full-term infants for single and plural births; live births in eight cities* [1]

Single or plural birth	Deaths of infants prematurely born				
	Actual	Expected at average rates among all full-term infants		Expected at average rates among full-term single and plural infants	
		Number	Ratio [2]	Number	Ratio [2]
Total	626	102.0	6.14	122.1	5.13
Single	550			87.3	6.29
Plural	76			34.8	2.18

[1] For basic figures see General Table 46, p. 204.
[2] Ratio of actual to expected deaths.

Sex.

A slightly larger proportion of the premature than of the full-term infants were of the male sex—54.3 per cent as compared with 50.8 per cent. (See General Table 4, p. 188.) Since the death rate among the males was somewhat higher than that among the females, the slightly greater preponderance of males among the premature would account for a small part of the excess mortality associated with prematurity.

The influence of this factor, however, was not great, for when allowance was made for it in Table 60 and the actual deaths among the male and female premature infants were compared with those expected at the rates prevailing among the male and female full-term infants, the relative mortality among the premature was reduced from 6.14 only to 6.10 times that among the full-term births.

TABLE 60.—*Relative mortality among premature and full-term infants, by sex; live births in eight cities*

Sex	Deaths of infants prematurely born				
	Actual	Expected at average rates among full-term infants		Expected at average rates among full-term infants of the same sex	
		Number	Ratio [1]	Number	Ratio [1]
Total	626	102.0	6.14	102.7	6.10
Male	359	----------	----------	61.1	5.88
Female	267	----------	----------	41.6	6.42

[1] Ratio of actual to expected deaths.

Death of mother.

Of the premature births 2.4 per cent were to mothers who died within one year after confinement, as compared with only 0.5 per cent of the full-term births. (Compare General Tables 7 and 47, pp. 189 and 204.) Since the infants born to mothers who died within one year after confinement were characterized by a very heavy death rate during the first year of life (p. 33), the high mortality among the premature was due, in part, to the larger proportion among them of infants born to such mothers. This disproportionate number of births to mothers who died was not, however, a very important influence in the high mortality among the premature as compared with that among the full-term infants, as Table 61 shows. Though the death rate for the infants prematurely born to mothers who died was three times that for the infants born at term to such mothers, the rate for the other premature was over six times that for the full-term infants.[1] When these two ratios were averaged the relative mortality among the premature appeared to be 5.84 times that among the full-term infants, as compared with 6.14 when no account was taken of the disproportionate number of premature infants whose mothers died.

[1] The limitations restricting the use of such ratios are well illustrated in this example, for, although the mortality among the infants prematurely born to mothers who died within one year after confinement was practically 1,000, it was only about three times that among the infants born at term to mothers of this group. Nevertheless, though great weight should not be placed upon small variations between the ratios, the comparison expresses the differences between the groups in an effective manner. In such cases as these a better idea of the relative influence of prematurity can be gained by a study of the ratios and the mortality rates.

TABLE 61.—*Relative mortality among premature and full-term infants, by death of mother; live births in eight cities*

Death of mother at or within one year after confinement	Deaths of infants prematurely born				
	Actual	Expected at average rates among all full-term infants		Expected at average rates among full-term infants in specified group	
		Number	Ratio [1]	Number	Ratio [1]
Total	626	102.0	6.14	107.3	5.84
Mother died at or within one year after confinement	27			8.7	3.10
Mother survived the year	599			98.6	6.08

[1] Ratio of actual to expected deaths.

Type of feeding.

A markedly larger proportion of the premature than of the full-term infants were artificially fed. Thus of the babies who lived to be fed, 23 per cent of the premature, as compared with only 9.7 per cent of those born at term, were given exclusively artificial feeding during the first month. In the ninth month the artificially fed constituted 51.5 per cent of the premature, as compared with 34.5 per cent of the full-term infants. (See General Table 48, p. 205.) And of the months up to the end of the ninth lived by babies who were prematurely born 40.2 per cent were months of artificial feeding, as compared with only 24.4 per cent of those lived by babies who were born at term.[2] Since such feeding was found to be associated with a markedly high death rate, as will be shown later (p. 89), the mortality among the premature as compared with the full-term infants might have been increased by the disproportionate number of artificially fed among the former.

When allowance was made, as in Table 62, for variations in the prevalence of breast and artificial feeding, a very great difference was found between the mortality among the premature and that among the full-term infants during the first day or two of life before feeding was commenced. In fact, the mortality during this period among the premature was over 30 times that among the full-term babies.

Of the infants who lived to be fed the mortality among the prematurely born averaged 4.3 times that among the babies born at term who received the same type of feeding. Of those breast fed the mortality was nearly nine times as high among the premature as among the full-term infants, while of the artificially fed the mortality among the former was not quite three times as high as that among the latter.

[2] This tendency was found not only among the plural premature but also among the single premature. Of the months up to the end of the ninth lived by the premature single infants 38.7 per cent were months of artificial feeding, as compared with 24.1 per cent of those lived by full-term single infants. The corresponding percentages for the premature and full-term twins and triplets were 55 and 43.5. See General Table 49, p. 205.

TABLE 62.—*Relative mortality of premature and full-term infants in eight cities, by type of feeding*

Type of feeding	Infant deaths		
	Actual	Expected	Ratio of actual to expected
Total	626	76.51	8.2
Not fed	340	10.89	31.2
Total fed	283	65.62	4.3
Breast	131	14.85	8.8
Partly breast	23	5.34	4.3
Artificial	129	45.43	2.8
Not reported	3		

Other factors.

The correlations between the proportion of premature births and factors other than those already discussed are of comparatively little importance in explaining the relatively high mortality among the premature infants. In other words, the high mortality among the premature relatively to that among the full-term infants is not to be explained to any extent by undue proportions among them of births, for example, of orders, or to mothers of ages, or following preceding births by intervals, for which the infant mortality rates were high.[3]

Order of birth.—Of the premature infants a slightly smaller proportion than of those born at term (19.6 per cent as compared with 26.4 per cent) were of orders fifth and later, for which the death rates were above average. (See General Table 50, p. 206.) The high mortality among the premature was not due, therefore, to any unfavorable weighting of this group with births of orders characterized by high rates. On the contrary, a correction for the disproportionate number of births of low orders among the premature would tend to increase the ratio of the mortality among them to that of the full-term infants.

Age of mother.—On the other hand, a slightly larger proportion of the premature than of the full-term births (25.3 per cent as compared with 22.6 per cent) were to mothers who either were under 20 or were 35 years of age or over; that is, belonged to age-of-mother groups for which the death rates were above average. (See General Table 51, p. 206.) The high mortality among the premature might have been caused in part, therefore, by the somewhat disproportionate number of such infants born to mothers of these age groups. But this influence was the opposite of that shown for order of birth; and, since the differences in the proportions were not great, it may be that the two influences tended to cancel each other.

Interval since preceding birth.—Of the premature infants second and later in order 18.8 per cent, as compared with 12.1 per cent of the full-term infants of the same orders, were born at short intervals[4] after the next preceding births; i. e., belonged in the interval group for which

[3] Nevertheless order of birth, for example, may be an important causal factor in the occurrence of premature births, a point which is of especial interest in the analysis of the reasons for the variation in mortality among infants of different orders. The influence of each of these other factors in the occurrence of premature births is discussed further later in this section (pp. 77 to 78) and also in connection with the analysis of the influence of each of these factors upon the infant mortality rate.

[4] For definition of "short interval" see p. 60.

the mortality rate was above average. (See General Table 52, p. 206. On the other hand 39.5 per cent of the premature, as compared with only 26.5 per cent of the full-term infants, were first infants, among whom the mortality rate was considerably below average.[5] Evidently these two influences, also, tended to offset each other.

Color and nationality of mother, and economic factors.—A considerably smaller proportion of the premature than of the full-term births (25.2 per cent as compared with 32.7 per cent) were to mothers of nationalities for which the mortality rates were above the average. (See General Table 53, p. 206.) Of the premature, furthermore, a slightly smaller proportion than of the full-term infants (39.2 per cent as compared with 42.6 per cent) were born in families in which the fathers earned less than $650, a group for which the mortality rate was above the average. (See General Table 54, p. 207.) These differences seem to be of relatively minor importance; but if allowances were made for the slightly smaller proportions among the prematurely born of infants who were handicapped either by the nationality customs and traditions or by the comparatively low economic status of their families, the relative mortality among the premature as compared with that among the full-term births would appear to be slightly increased. On the other hand, a slightly larger proportion of the premature than of the full-term infants (16.1 per cent as compared with 13.3 per cent) were born to mothers who were gainfully employed away from home during pregnancy. (See General Table 55, p. 207.) The effect of a correction for the slightly greater prevalence of such employment among the mothers of premature than among those of full-term infants would tend to offset the corrections for nationality of mother and earnings of father.

So far as explaining the high mortality among premature infants is concerned, these correlations with social and economic factors are of relatively little importance.

Causes of prematurity.

Since the mortality among the premature was in all circumstances very high as compared with that among the full-term infants, the causes that produce or influence prematurity are of especial interest. The preceding discussion has indicated several factors that appear to have influenced the occurrence of premature births. The high proportion of premature among twins and triplets suggests that plural birth or some factor connected with it may have been responsible in some cases for shortening the period of gestation. (See Table 59, p. 73.) Sex seems also to have had an influence, for the proportion of premature births among males was slightly greater than that among females. (See Table 60, p. 74.) Furthermore, prematurity was unusually prevalent among first babies, among the infants of young mothers, and among infants who were born at short intervals after preceding births. (See Table 33, p. 52; Table 19, p. 44; Table 48, p. 64; and General Table 35, p. 200.) Finally, the proportion of premature among births to mothers employed away from home during pregnancy was especially high. (See Table 117, p. 134.) These correlations point to some of the causal influences that seem to have affected the occurrence of premature births.

[5] See Table 33, p. 52, for figures upon which the percentages are based.

Most of these factors depend in last analysis upon the health and condition of the mother. In some cases the tendency toward prematurity appears to have been influenced by the type of birth—whether plural or single, male or female; in other cases it seems to have been influenced by the environment of the mother, as when she went out to work during her pregnancy period. But the direct relation which the mother's health bears to prematurity was shown in the very high proportion (39.3 per cent) of premature among infants live born to mothers who died either at or within one month after confinement. (See General Table 7, p. 189.) Apparently, in many cases, the condition that caused the mother's death caused also the premature birth of the child.

Summary.

The mortality among the premature was found to be five or six times as high as that among the full-term infants, whether the rates were compared for all infants, for those of the same sex, for single or plural births, or for infants receiving the same type of feeding. The excessive mortality occurred especially in the first week or the first month; but even during the later months of the first year of life the mortality was much greater among the premature than among the full-term infants. Causes peculiar to early infancy and malformations produced the greatest excess, but other causes—gastric and intestinal diseases, respiratory diseases, and epidemic diseases—also caused greater mortality among the premature than among the full-term infants.

PLURAL BIRTHS

The group of twins and triplets comprised 529, or 2.3 per cent of the total number of live births, and included 513 twins and 16 triplets. These infants represented a total of 272 confinements; in a number of cases one twin or one or two triplets were stillborn and therefore were not included in the number of live births. Slightly over 1 per cent of all confinements resulted in plural births.

An extremely high mortality rate characterized the twins and triplets. As Table 63 shows, this group of infants had a rate of 362.9, or 3.45 times that of the single births (105.3).

Nevertheless, the fact that less than one-half of all the twins and triplets born died before their first birthday indicates that the total number of survivors at the end of the first year was greater than it would have been if these confinements had resulted in single instead of in plural births. From each 1,000 confinements resulting in single births, both live births and stillbirths, 865 infants were found to have survived the first year of life. At the mortality rates that prevailed for plural births, however, from 1,000 confinements resulting in the birth of twins or triplets, both live and still born, 1,212 infants would have survived the first year of life. The proportion of survivors at the end of one year from confinements resulting in plural births was one-third greater than that of survivors at the end of one year from an equal number of confinements resulting in single births. Since, however, only about 1 per cent of the confinements resulted in the birth of twins or triplets, the occurrence of such births did not make any considerable addition to the number of infants who lived to become 1 year of age.

TABLE 63.—*Infant mortality rates for single and plural births; live births in eight cities*

Number at the birth	Live births	Infant deaths	Infant mortality rates [1]
Total	22,967	2,555	111.2
Single	22,438	2,363	105.3
Plural	529	192	362.9
Twins	513	181	352.8
Triplets	16	11	

[1] Not shown where base is less than 100.

Causes of death.

The mortality from the principal causes of death among the twins and triplets, in comparison with that among the single-born infants, is shown in Table 64. Slightly over half the deaths of twins and triplets were ascribed to causes peculiar to early infancy. Their mortality rate from these causes was 187.1, or nearly six times that of the single-born infants (32.6). From gastric and intestinal diseases the rate for twins and triplets was 87, nearly three times as high as the figure for single-born infants, which was only 31.1. From respiratory diseases the mortality was twice as high, from the group of epidemic diseases two and one-half times as high, and from all other causes twice as high as among single-born infants.

TABLE 64.—*Infant mortality rates, by cause of death and term, for single and plural births; live births in eight cities* [1]

Cause of death	Infant mortality rates [1]					
	Plural births			Single births		
	Total	Full term	Premature	Total	Full term	Premature
All causes	362.9	285.0	623.0	105.3	84.3	530.9
Gastric and intestinal diseases	87.0	100.7	41.0	31.1	30.3	44.4
Respiratory diseases	41.6	39.3	49.2	19.1	18.6	27.0
Malformations	5.7	4.9	8.2	4.3	3.6	18.3
Early infancy	187.1	90.9	508.2	32.6	14.9	392.9
Epidemics and other communicable diseases	18.9	22.1	8.2	6.8	6.3	15.4
External causes	1.9	2.5		.6	.6	1.0
Diseases ill defined and unknown	3.8	4.9		2.5	2.1	9.7
Other causes	17.0	19.7	8.2	8.5	7.8	22.2

[1] The numbers of births on which these figures are based were as follows: Plural—529, of which 407 were full term and 122 were premature; single—22,438, of which 21,352 were full term and 1,036 were premature.

Neonatal mortality.

The deaths during the first month among the twins and triplets were 172 per 1,000 live births, as compared with a rate for the single-born infants of only 41.8. This difference reflects the differences in the incidence of mortality from causes peculiar to early infancy. (See General Table 57, p 208.)

Prematurity.

The high mortality both during the first month and from causes peculiar to early infancy is explained in part by the much larger proportion of prematurely born among the twins and triplets than among the other infants. Of the plural births 22.9 per cent and of the single births only 4.6 per cent were premature. Nearly five times as many proportionately were prematurely born among the twins and triplets as among the single-born babies.

Nevertheless, when the mortality rates for the full-term, as well as for the premature, plural and single births were compared it was found that in both cases the plural had a markedly higher mortality than the single. Among the infants reported as born at term the rate for the plural was 285, or over three times that for the single (84.3). Among those reported as born prematurely, though both plural and single had very high rates (623 for the former and 531 for the latter), the plural appear still to have been at a distinct disadvantage. Evidently, though the fact of premature birth alone resulted in a high mortality rate, the twins and triplets among both the full-term and the prematurely born were under a handicap.

Causes of death and prematurity.

The rates of death from the principal causes for the infants of single and plural full-term and premature birth are also given in Table 64. Among the infants born at term, differences in favor of the single appear for every cause of death. The contrast is especially noteworthy in the case of the rate from gastric and intestinal diseases, which was over three times as high for the twins and triplets as for the single-born infants. The excess mortality of the former group from these diseases was due in part to the fact, shown in the next subsection, that more of them than of the single-born babies were exposed to the hazards arising from artificial feeding.

The fact that mortality from causes peculiar to early infancy was six times as high among the full-term twins and triplets as among the single full-term infants must perhaps be explained largely in terms of lesser vitality at birth, the causes of which are not fully understood. This lack of vitality may also have played a part in the mortality of full-term twins and triplets from respiratory, epidemic, and other diseases, which was likewise considerably higher than among single infants born at term.

The difference between the rates for single and plural premature infants was due largely to a difference in the mortality from causes peculiar to early infancy. In fact, with the exception of respiratory diseases, deaths from the other causes were more prevalent among infants of single than among those of plural birth; but these rates were based on relatively few cases—too few to justify a definite conclusion on this point.

Type of feeding.

Artificial food was used much more commonly for twins and triplets than for single-born infants. During the first month, for example, 26.3 per cent of the former as compared with only 9.8 per cent of the latter were artificially fed. And of the total months lived up to the end of the ninth, 45.1 per cent of those lived by the former as compared

with only 24.5 per cent of those lived by the latter were months of artificial feeding. (See General Tables 49, p. 205 and 58, p. 208.)

The reasons for the greater prevalence of exclusively artificial feeding among the twins and triplets doubtless include inability of a larger proportion of their mothers to satisfy the requirements of two or three babies than of other mothers to satisfy the requirements of one. Since mothers are usually reluctant to give one twin the advantage of the other in type of feeding, the weaning of one meant, in most cases, the weaning of both. Another factor that may have affected the prevalence of artificial feeding among the twins and triplets was the tendency toward the giving of artificial food to the prematurely born, a group to which, as already stated, nearly one-fourth of the twins and triplets belonged. (See General Tables 49, p. 205 and 59, p. 209.)

Since the artificially-fed infants, as will be shown later (pp. 89–103), had a death rate that averaged between three and four times that for the breast-fed infants, the relatively greater prevalence of artificial feeding among the twins and triplets meant, of itself, greater mortality among them. The question then arises, how much of the excess mortality among the twins and triplets was due to the greater tendency to give them artificial food and how much would have remained if there had been no differences between the single and the plural births in respect to type of feeding?

In the whole group the mortality among the twins and triplets, as Table 65 shows, was 3.45 times that among the single-born infants. In other words, the actual deaths among the twins and triplets were 3.45 times the number that would have occurred if the rates that prevailed among single babies had prevailed among them. In the group of infants who died before they were fed the mortality among the twins and triplets was 4.19 times that among the single-born infants. When the actual number of deaths among the twins and triplets who lived long enough to be fed was compared with the number expected at the rate prevailing among the single-born babies who lived to be fed, the former was found to be 3.25 times the latter. But when the actual number of deaths among these twins and triplets was compared with the number expected at the rates prevailing among the single-born infants who received the same kinds of feeding during corresponding months of life, the ratio was reduced to 2.88. In other words, when allowance was made for differences in the type of feeding received the ratio between the mortality rates for infants of plural and of single birth was reduced by about one-ninth.

TABLE 65.—*Relative mortality among plural and single births, when effect of differences in term and in type of feeding is eliminated; infants in eight cities*

Type of feeding and term	Deaths of twins and triplets								
	Actual	Expected at average rates for all single births		Expected at average rates for single births—					
				Of the same term		While receiving the same type of feeding		Of the same term while receiving the same type of feeding	
		Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Total	192	55.71	3.45	99.10	1.94	61.34	3.13	102.62	1.87
Not fed	49	11.70	4.19			11.70	4.19	39.06	1.25
Total fed	143	44.01	3.25			49.64	2.88	63.56	2.25
Breast fed	33					8.53	3.87	15.82	2.09
Partly breast fed	26					6.46	4.02	5.45	4.77
Artificially fed	84					34.65	2.42	42.29	1.99
Full term	116			34.33	3.38			40.72	2.85
Not fed	9							3.73	2.41
Total fed	107							36.99	2.89
Breast fed	20							6.05	3.31
Partly breast fed	20							5.20	3.85
Artificially fed	67							25.74	2.60
Premature	76			64.77	1.17			61.90	1.23
Not fed	40							35.33	1.13
Total fed	36							26.57	1.35
Breast fed	13							9.77	1.33
Partly breast fed	6							.25	24.00
Artificially fed	17							16.55	1.03

In the group of babies who were wholly breast fed, the death rate among the twins and triplets was 3.87 times that among the single-born babies. In the group of artificially-fed infants, on the other hand, the mortality among the twins and triplets was only 2.42 times that among the single-born babies. The fact of artificial feeding alone seems to have involved such an extra hazard that among the artificially fed the high mortality of twins and triplets became relatively less important. Nevertheless, a marked disadvantage was associated with plural birth both for breast-fed and for artificially-fed infants.

Prematurity and type of feeding.

Since a larger proportion of prematurely born infants were artificially fed than of those born at term, the discussion of the relative mortality of plural as compared with that of single-born infants should take into account this overlapping of the groups. The infants classed as "not fed" were nearly all prematurely born; and the excessive mortality among the "not fed" twins and triplets is seen upon analysis to have depended largely upon the disproportionate number of this group who were prematurely born. When comparison was made for the "not fed" group between the mortality rates for infants of full-term plural and full-term single birth and between those for infants of premature plural and premature single birth the ratio of the mortality of the plural to that of the single was found to be only

1.25. For the group of infants who lived to be fed a similar comparison between death rates of plural and single of the same term receiving the same type of feeding reduced the ratio of the mortality rate of infants of plural birth to that of the single born from 2.88 to 2.25. In the entire group, when allowance was made for both prematurity and type of feeding, the ratio of the mortality among infants of plural birth to that of single-born infants was reduced from 3.45 to 1.87. In other words, even after full weight was given both these other factors, the twins and triplets had a death rate nearly twice as high as that of the single-born infants.

Furthermore, among the infants born at term who lived long enough to be fed—a group in which the obvious handicap of prematurity was not a factor—the plural had a mortality rate nearly three times that of the single even after allowance was made for the larger proportion of the former who were artificially fed.

Other factors.

Since on analysis significant correlations between the occurrence of twins and triplets and order of birth and age of mother were found, study should be made of the possible influence of these factors in causing higher mortality among plural births. The interrelations between the occurrence of plural births and nationality and economic factors should also be examined.

Order of birth.—A larger proportion of the plural than of the single births were fifth and later in order—34 per cent as compared with 25.8 per cent. (See General Table 61, p. 209. Compare also Text Table 35, p. 53.) Since the mortality among the births fifth and later in order was higher than the average rate (p. 48), the excess mortality among the plural as compared with the single infants seems to have been partially due to the overweighting of the group of twins and triplets with infants of these late orders. But this influence was found upon analysis to have been relatively slight. When the mortality of plural was compared with that of single infants, order for order, the average ratio between the rates was reduced from 3.45 only to 3.37. (See General Table 62, p. 210.)

Age of mother.—Almost the same proportion of the single as of the plural births were to mothers under 20 or to those 35 years of age and over—22.8 per cent as compared with 22.7 per cent. (See General Table 60, p. 209.) Compare Text Table 20, p. 44.) The mortality rates for infants born to mothers under 20, as well as for those born to mothers 35 and over, were higher than those for the babies of mothers between 20 and 35 years of age (p. 35). When the rates were compared for plural and single births to mothers of the same ages the ratio was raised from 3.45 to 3.48. (See General Table 62, p. 210.)

When the effects of both age of mother and order of birth were eliminated, and the death rates for plural and single births were compared, order for order and age of mother for age of mother, the ratio between them was practically identical with that found when order of birth alone was eliminated (3.37). (See General Table 62, p. 216.)

Color and nationality of mother and economic factors.—An analysis of the prevalence of plural births to mothers of the several race and nationality groups showed no marked or significant differences in the

proportions of twins and triplets. (See General Table 63, p. 210.) Nor were significant differences found in the proportions of plural births to mothers of the different earnings groups. (See General Table 64, p. 211.) These factors seem to have played no part in the high mortality among plural births.

Mortality among pairs of twins.

An analysis of the mortality among the pairs of twins reveals the interesting fact that the death of one member of a pair was correlated with the death of the other and the survival of one with the survival of the other. For the sake of simplicity in statement, only the 247 pairs of which both members were born alive are considered in this discussion. Of these 494 live-born twins 176 died under 1 year of age, giving a mortality rate of 356.3 for this group. If the survival or death of one twin of a pair had been entirely independent of that of the other, according to the mathematics of chance, in 31 of the 247 cases both twins would have died, in 102 both twins would have survived, and in 113 one twin would have died and one would have survived.[6] Actually, instead of 31 pairs, 63 were found in which both died. Hence, one of a pair of twins of which the other had died, appears to have been more likely to die also than one of a pair of which the other had survived. (See General Table 56, p. 207.)

This fact is explained in part by the tendency of twins both to be born prematurely or both to be born at term. Among the 247 pairs only 1 was found in which one twin was reported born at term and the other prematurely. When, therefore, one twin died because of premature birth the other, also, had been born prematurely, and was subject to a much heavier risk of dying than if born at term.

But even after allowance was made for the tendency of both twins of a pair to be born after the same period of gestation, a considerably larger number of pairs were found in which both died than would have been expected if the death of one had not been in some other way associated with the death of the other. Among the 55 prematurely born pairs of twins, there were 29 cases in which both infants died, as compared with 20 expected at the average rate of mortality for this group on the hypothesis that the death or survival of one was independent of that of the other; and among the 191 pairs born at term there were 34 cases in which both died, as compared with 16 expected on this hypothesis.

In further explanation of this relationship may be mentioned the fact that the twins were of the same sex in about two-thirds of the cases. In such cases the greater mortality among male than among female infants would result in both twins dying in more cases than would be expected at average rates for the entire group.

Other explanations come easily to mind. The type of feeding that one twin received was probably, as a rule, the same as that received by the other. Mothers, it has already been noted, are usually reluctant to give one twin the advantage of the other in the type of feeding; when, therefore, a mother was obliged because of her own ill-health or for any other reason to give up breast feeding

[6] If p is the probability of dying (.3563) and q is the probability of surviving the first year (.6437), then the probability of both twins dying is p^2, of both twins surviving, q^2, and of one twin dying and the other surviving, $2pq$. These figures multiplied by n (247, the number of pairs) give the values stated in the text ($np^2=31.36$; $2npq=113.29$; $nq^2=102.34$). It will be noted that the process of rounding off to the nearest whole unit leaves one pair unaccounted for.

for one infant, she was very likely to give it up for both. If one twin, then, was exposed to the greater risk associated with artificial feeding the other was likely to have been so exposed.

Furthermore, the environment surrounding one of a pair of twins was in practically all cases probably more or less similar to, if not identical with, that surrounding the other. If one twin was subjected to good or to bad environmental conditions—the conditions associated, for example, with earnings of the father, nationality of the mother, the mother's employment, or housing congestion—the other twin in all probability had the same advantages or disadvantages.

Causes of plural births.

The data under consideration throw little light upon the causes of plural births. These causes are biological or physiological conditions that affect the ovum and that are commonly regarded as hereditary.[7]

The mother of each infant included in the study reported not only on the birth of that infant but also on the number of her previous pregnancies and as to whether they had resulted in single or in plural births. The proportion of all the pregnancies of these mothers that had resulted in the birth of twins or triplets was practically the same as that of the pregnancies that resulted in plural births in the selected year, and the number of mothers who had had one or more such births was 725, or 3.3 per cent of the total. (See General Table 65, p. 211.) But while only 1 per cent of all the pregnancies included in the study resulted in the birth of twins or triplets, of those that followed plural births 3 per cent resulted in such births.

Since the proportion of twins and triplets born to mothers shown by previous plural births to possess hereditary or other physiological characteristics which make such births possible was only three times as great as the proportion among all births, the inference might be drawn that some such characteristic was possessed by one-third of all the mothers.[8] This inference, however, would rest upon the assumption that there was no physiological cause for a greater prevalence of plural births among births resulting from later as compared with earlier pregnancies. For if twins and triplets were more likely to occur in later pregnancies the larger proportion of such births among pregnancies following plural births might have been due in part to the fact that these pregnancies were on an average of later orders.

When the comparison was made order for order (after the first), the actual number of pregnancies resulting in plural births among pregnancies of mothers who had previously given birth to twins or triplets was found to be only two and one-half (2.45) times the number of pregnancies expected so to result at the rates for the occurrence of first plural births among births of each order. Hence, unless the occurrence of one plural birth had a definite influence per se upon the occurrence of a later plural birth, either to make it less

[7] Prinzing, F.: Handbuch der medizinischen Statistik, pp. 68–69. Jena, 1906.

[8] The calculation is as follows: Let x be the proportion of births to mothers having a hereditary or other predisposition to plural birth among the entire group of births; x times the proportion of such births that are plural would give all the plural births in the entire group, or 1 per cent. Among the group of births following previous plural births, that is, births to mothers having a hereditary or other predisposition to plural births, 3 per cent were plural; at this rate, $3x = 1$; and $x = \frac{1}{3}$.

or to make it more likely, the hereditary or other physiological predisposition to twins must have been widely diffused, affecting two-fifths of the mothers.[9]

Summary.

Twins and triplets had a death rate nearly three and one-half times as high as that of single-born infants. Their mortality from causes peculiar to early infancy was especially high, but their rates from other causes were also markedly above those for single-born infants.

Of the twins and triplets over one-fifth (22.9 per cent), as compared with less than 5 per cent of the single babies, were prematurely born. This disproportionate number of premature births seems to have accounted for a considerable part of the excessive mortality of the twins and triplets. Another element in their high death rate was the large proportion who were artificially fed. But even when both these factors were allowed for the mortality among the plural was nearly twice that among the single-born infants. Evidently some other element was a factor in producing this high mortality.

In case of the larger proportion of prematurely born infants the fact of plural birth may itself have been the causal factor. If so, the reduction of the high infant mortality rate would have required the prevention of prematurity among the twins and triplets. A decrease in early weaning and a more careful observance of safeguards in connection with the giving of artificial food would also, it appears, have reduced their high mortality.

TYPE OF DELIVERY

Information concerning the delivery by Cæsarean section or delivery by means of instruments was obtained for births in Baltimore. The results of this inquiry are given in Table 66. Of the total number of infants born alive the mothers of 15 (one-tenth of 1 per cent) were delivered by Cæsarean section. Three of these babies died under 1 year of age. The mothers of 748 (6.9 per cent) had instrumental delivery. For these the infant mortality rate was 120.3, considerably higher than that for infants of mothers whose deliveries were normal (102.1).

TABLE 66.—*Infant mortality rates, by type of delivery; live births in Baltimore*

Type of delivery	Live births	Infant deaths					
		All causes		Injuries at birth		Other causes	
		Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates
Total	10,797	1,117	103.5	44	4.1	1,073	99.4
Instrumental delivery	748	90	120.3	21	28.1	69	92.2
Cæsarean section	15	3				3	
Normal delivery	[a] 10,034	1,024	102.1	23	2.3	1,001	99.8

[a] Including 31 not reported.

[9] This analysis permits a correction in the proportion as calculated in footnote 8. Here $2.45x = 1$; and $x = 40.8$ per cent.

As would be expected for the infants of mothers delivered by means of instruments the death rate from causes peculiar to early infancy was considerably above that for other infants—60.2 as compared with 36. This excessive mortality was found on analysis to have been largely concentrated in the subgroup "injuries at birth," the rate for which was especially high—28.1 as compared with 2.3 for normal births. All the other causes included in the group "early infancy" had a combined rate practically identical with that for normal births—32.1 as compared with 33.7.

The mortality rate from all causes other than those peculiar to early infancy in the group of instrumental-delivery births was slightly lower than that for normal births—60.2 as compared with 65.8.

In passing it is interesting to note that a markedly smaller proportion of the instrumental-delivery births than of all others occurred in families in which the father's earnings were less than $650, the proportions being 29.8 per cent and 44.9 per cent, respectively. (See General Table 66, p. 211.)

TYPE OF FEEDING[1]

Information in regard to the type of feeding during each month of the first year of life was obtained for the 22,422 infants who lived to be fed.[2] These data make it possible to compare the number of deaths with the time lived by infants receiving each type of feeding, a procedure which yields statistically sound rates of mortality for the different types (p. 13.) This procedure also permits taking into account the varying mortality rates in the different months of life and the varying ages at which the infants were transferred from breast to partially or exclusively artificial feeding.

The kinds of feeding were classified into three types, exclusively breast, exclusively artificial, and partly breast and partly artificial. This grouping was not wholly satisfactory. The infants who received partially and exclusively artificial feeding were not classified in detail according to the character of the food given, and hence the analysis of the effect of types of feeding on infant mortality made in the present study had to be confined to the differences between exclusively breast and exclusively artificial feeding and between partially breast feeding and each of the other two groups, irrespective of the character of the artificial food.

TABLE 67.—*Type of feeding, by month of life; infants in eight cities*

Month of life	Infants surviving at beginning of specified month of life							
	Total	Exclusively breast fed during month		Partly breast fed during month		Exclusively artificially fed during month		Not reported
		Number	Per cent	Number	Per cent	Number	Per cent	
First	[1] 22,422	19,438	86.7	686	3.1	2,287	10.2	11
Second	21,939	17,178	78.3	1,294	5.9	3,457	15.8	10
Third	21,735	15,509	71.4	1,786	8.2	4,431	20.4	9
Fourth	21,560	13,516	62.7	2,668	12.4	5,366	24.9	10
Fifth	21,387	12,263	57.3	3,317	15.5	5,797	27.1	10
Sixth	21,222	10,969	51.7	4,098	19.3	6,145	29.0	10
Seventh	21,066	8,641	41.0	5,801	27.5	6,615	31.4	9
Eighth	20,934	7,343	35.1	6,671	31.9	6,911	33.0	9
Ninth	20,812	5,853	28.1	7,684	36.9	7,268	34.9	7
Tenth	20,693	4,248	20.5	8,591	41.5	7,845	37.9	9
Eleventh	20,584	3,278	15.9	9,062	44.0	8,235	40.0	9
Twelfth	20,504	2,736	13.3	9,145	44.6	8,616	42.0	7

[1] Excluding 545 infants who died not fed.

PREVALENCE OF BREAST AND ARTIFICIAL FEEDING

Table 67 shows the increase in prevalence of artificial feeding from month to month during the first year of life. In the first month 86.7 per cent of the infants were breast fed, 3.1 per cent were partly breast fed, and 10.2 per cent were exclusively artificially fed. In the third month the proportion exclusively breast fed had fallen to

[1] A summary of this chapter was published in the American Journal of Hygiene, vol. 2, no. 6 (November, 1922).

[2] Infants who died without being fed numbered 545, 2.4 per cent of the total.

71.4, and that artificially fed had doubled, reaching 20.4 per cent. By the sixth month the proportion exclusively breast fed was only slightly over half, and that artificially fed had risen to nearly three-tenths. By the ninth month only 28.1 per cent were exclusively breast fed, the proportion partly breast fed had increased to 36.9 per cent, and the proportion exclusively artificially fed had increased to 34.9 per cent. At the end of the first year of life only 13.3 per cent of the infants continued to be exclusively breast fed; the proportion partly breast fed had risen to 44.6 per cent and that wholly artificially fed to 42 per cent. Up to the ninth month the proportion of artificially-fed exceeded that of partly breast-fed infants. From the ninth to the twelfth this relative position was reversed, and the proportion partly breast fed was slightly greater than that exclusively artificially fed. The greatest number of transfers from exclusively breast to partly breast or to artificial feeding took place between the sixth and the seventh month.

These figures can be summed up in convenient fashion in terms of months lived by infants who received each type of feeding. When the figures for the first nine months only are taken for this purpose —since, as will be shown later (p. 90), the type of feeding in these months was of greater importance than in the remainder of the first year of life—it was found that of the 192,212.5 months lived by the infants 57.4 per cent were months of breast feeding, 17.6 per cent were months of partially breast feeding and 24.9 per cent were months of artificial feeding. Thus not far from three-fifths of the months lived up to and including the ninth were months of breast feeding, and approximately one-fourth were months of artificial feeding.

MONTHLY DEATH RATES, BY TYPE OF FEEDING

In Table 68 monthly death rates are shown for each month of the first year of life. By comparing the rates in each month for the three types of feeding the relations between these rates are made clear. In the first month mortality among the artificially-fed infants was over three times that among the breast fed; in the second month it was four times, in the third nearly six times, in the fourth, fifth, sixth, and seventh months over five times, in the eighth four times, and in the ninth slightly over three times that among the breast-fed infants. After the ninth month the relative advantage of breast feeding was much less.

The relation between the rates for partly breast-fed babies and those for infants in the other two groups is also shown. In each of the first eight months the mortality among the partly breast-fed was higher than that among the wholly breast-fed and lower than that among the artificially-fed infants. In the first month it was twice that for exclusively breast-fed babies; it rose to about two and one-half times in the second month; in the third it was over three times, in the fourth nearly three times, in the fifth nearly twice, in the sixth nearly three times, in the seventh twice, in the eighth slightly greater than, and in the ninth slightly less than the rate for babies who were wholly breast fed. During the first nine months the rate for the partly breast-fed averaged about twice as high as that for the wholly breast-fed infants. For the same period the mortality among the babies who were exclusively artificially fed averaged about three times as high as that among the partly breast fed.

TABLE 68.—*Monthly death rates, by type of feeding; infants in eight cities* [1]

Month of life	Monthly death rates			
	All types of feeding	Exclusively breast fed	Partly breast fed	Exclusively artificially fed
First	[2] 44.8	16.9	36.4	54.7
Second	9.3	5.8	14.7	24.6
Third	8.1	3.7	12.9	21.2
Fourth	8.0	3.4	9.0	19.2
Fifth	7.7	3.3	5.7	18.1
Sixth	7.4	2.1	5.9	17.7
Seventh	6.3	1.9	4.0	14.1
Eighth	5.8	2.9	3.3	11.3
Ninth	5.7	3.2	2.9	10.7
Tenth	5.3	3.8	2.3	9.3
Eleventh	3.9	2.4	2.5	6.0
Twelfth	4.5	4.4	2.7	6.4

[1] For basic figures see General Table 67, p. 212.
[2] The rate per 1,000 fed is 21.5; 545 infants died not fed.

A convenient method of summing up the relative disadvantage of artificial feeding, shown in Table 69, is to compare the deaths which actually occurred among the artificially-fed infants with the number that would have occurred if the rates found for the breast fed had prevailed among them. In this comparison allowance can be made for the decrease in mortality with increase in age. When the monthly death rates for breast-fed babies were applied to the infants who were artificially fed in the corresponding months, it was found that instead of the 1,047 deaths that actually occurred among the artificially-fed infants, only 268.6 would have been expected. In other words, the actual deaths were nearly four times those that would have been expected at the rates prevailing for the babies who were breast fed.

When a similar comparison was made of the number of deaths that actually occurred among the partly breast-fed infants with the number that would have been expected if the rates for the wholly breast fed had prevailed, it was found that only 203.8 deaths would have occurred instead of 269. The mortality among the partly breast-fed, that is, averaged 1.32 times as high as that among the wholly breast-fed infants.

TABLE 69.—*Mortality among partly breast-fed and among artificially-fed infants as compared with that of breast-fed infants, during first nine and last three months of the first year; infants in eight cities*

Period	Deaths of partly breast-fed infants			Deaths of artificially-fed infants		
	Actual	Expected at rates for breast fed in same months	Ratio of actual to expected	Actual	Expected at rates for breast fed in same months	Ratio of actual to expected
Total	269	203.8	1.32	1,047	268.6	3.90
First 9 months	201	109.1	1.84	870	181.1	4.80
Last 3 months	68	94.7	.72	177	87.5	2.03

When the comparison was limited to the first nine months of life, however, the excess mortality both among artificially-fed and among partly breast-fed infants appeared more marked. Thus during the first nine months 870 deaths of artificially-fed infants occurred, as compared with only 181.1 that would have been expected at the rates prevailing for those who were breast fed. In other words, during this period the rates of mortality for the artificially-fed averaged 4.8 times as high as for the breast-fed babies. Among the partly breast fed 201 deaths occurred during the first nine months, as compared with only 109.1 expected on the basis of the rates prevailing for the wholly breast fed. The monthly death rates for the partly breast-fed babies, that is, averaged not quite twice (1.84 times) as high as those for the more favored group of infants who received exclusively breast feeding.

INFLUENCE OF CHANGES IN FEEDING

The data secured on this subject also throw light upon the relative advantage or disadvantage of a change from breast feeding to partly or wholly artificial feeding at different times during the first year of life. The contrast between the mortality among infants who in a given month ceased to be exclusively breast fed and that among babies who continued to be breast fed is shown in Table 70 in the form of a comparison between the average monthly death rates from each month to the end of the first year for two groups of infants, those whose breast feeding ceased with or was first supplemented during the month and those whose breast feeding continued to the end of the year.

The average monthly death rates from the second, third, fourth, fifth, and sixth months to the end of the first year among infants whose breast feeding ceased or was first supplemented in these months were higher than the corresponding rates among those who were exclusively breast fed to the end of the year. When the change from breast to partially or exclusively artificial feeding took place in the seventh month or afterwards, however, the average death rates for the subsequent months of the year were slightly less than the corresponding rates for babies who were breast fed up to the end of the year.

A comparison of these average rates with the mortality in the different months among infants who were breast fed during those months indicates not only that the breast-fed babies had rates in the seventh and eighth months below the average from the seventh or eighth month to the end of the year for babies who were either partly or wholly weaned during that period, but also that they had rates lower than the average monthly rate for infants who were exclusively breast fed during these later months of the first year.

TABLE 70.—*Relative advantage or disadvantage of a change from exclusively breast feeding, as shown by average monthly death rates from time of change to end of first year of life, by month of life in which change was made; infants in eight cities*

Month of life	Infants whose breast feeding ceased or was first supplemented in specified month			Infants exclusively breast fed	
	Subsequent months lived to end of first year	Deaths	Average monthly death rate	Average monthly death rate from specified month to end of year	Monthly death rate in specified month
First	[1] 7,509	92	12.3	4.5	16.9
Second	19,811	260	13.1	3.3	5.8
Third	14,915	155	10.4	3.1	3.7
Fourth	16,915	111	6.6	3.0	3.4
Fifth	9,480	44	4.6	3.0	3.3
Sixth	8,652	36	4.2	3.0	2.1
Seventh	13,722	36	2.6	3.1	1.9
Eighth	6,357	21	3.3	3.3	2.9
Ninth	5,848	14	2.4	3.4	3.2
Tenth and later	7,190	12	1.7	3.5	3.5

[1] The rate for the first month is not exactly comparable with those for later months. The figures for the second month, for example, include infants who were exclusively breast fed in the first but either partially or exclusively artificially fed in the second; the figure for the first month, however, includes only infants who were partially breast fed during the greater part of the month, and these may or may not have received exclusively breast feeding for a period not exceeding two weeks. Infants who received exclusively breast feeding for less than two weeks and were then transferred to exclusively artificial feeding, on the other hand, are not included. These differences may explain the slightly lower rate found for the first month as compared with the second.

Table 71 throws light on the relative advantage or disadvantage of weaning at different times during the first year, by comparing the average monthly death rates from the month of weaning to the end of the first year of infants whose wholly artificial feeding commenced in a given month with those of infants who were exclusively breast fed during the same periods.[3]

The figures show higher mortality rates among infants who were weaned before the eighth month than among infants who continued to be breast fed. For infants weaned after the eighth month, however, the rates were not substantially higher than for those who continued to be breast fed. Unfortunately the fact that in the data available for study the period of observation was cut off at one year caused the number of months and of deaths to diminish rapidly, with the result that the numbers, especially for changes after the eighth month, were small.

[3] In Table 71 infants who were exclusively artificially fed at some time during the first year of life were classified according to the month in which exclusively artificial feeding began; in Table 70 infants who were exclusively breast fed at some time during the first year of life were classified according to the month in which breast feeding ceased or ceased to be exclusive.

TABLE 71.—*Relative advantage or disadvantage of a change to exclusively artificial feeding, as shown by average monthly death rates from time of change to end of first year of life, by month of life in which change was made; infants in eight cities*

Month of life	Infants whose exclusively artificial feeding commenced in specified month			Exclusively breast-fed infants	
	Months lived to end of year	Deaths	Average monthly death rates	Average monthly death rates to end of year	Monthly death rate in specified month
First	23,189	535	23.1	4.5	16.9
Second	13,089	196	15.0	3.3	5.8
Third	10,015	128	12.8	3.1	3.7
Fourth	8,896	89	10.0	3.0	3.4
Fifth	4,149	34	8.2	3.0	3.3
Sixth	3,112	27	8.7	3.0	2.1
Seventh	3,425	17	5.0	3.1	1.9
Eighth	1,942	6	3.1	3.3	2.9
Ninth and later	5,059	16	3.2	3.4	3.4

CUMULATIVE INFLUENCE OF EARLY ARTIFICIAL FEEDING

A comparison of the monthly death rates for all infants who were exclusively artificially fed during the ninth to twelfth months—10.7, 9.3, 6, and 6.4, respectively, as shown in Table 68—with the average rate from the time of weaning up to the end of the year for infants whose exclusively artificial feeding did not begin until the ninth or a later month—3.2, as shown in Table 71—indicates clearly that artificial feeding during the early months had a cumulative effect which appeared in excessive mortality in the later months. Table 72, which shows monthly death rates for the groups of infants whose artificial feeding commenced in the different months up to the ninth, brings out clearly this effect. In each month of life the mortality tended to be higher the longer the period of previous artificial feeding. For example, the rate in the fifth month for infants whose artificial feeding commenced in the first was 24, as compared with rates in the fifth month for those whose artificial feeding commenced in the second of 18.7, in the third of 18.3, in the fourth of 13.6, and in the fifth of only 3.8.

TABLE 72.—*Monthly death rates, by duration of previous artificial feeding; infants in eight cities* [1]

Month of life	Monthly death rates of infants—		Monthly death rates of infants artificially fed from—								
	Exclusively breast fed	Artificially fed [2]	First month	Second month	Third month	Fourth month	Fifth month	Sixth month	Seventh month	Eighth month	Ninth month and later
First	16.9	55.2	55.2								
Second	5.8	24.7	33.6	10.0							
Third	3.7	21.3	26.1	21.1	12.2						
Fourth	3.4	19.2	29.8	19.9	16.1	1.0					
Fifth	3.3	18.1	24.0	18.7	18.3	13.6	3.8				
Sixth	2.1	17.8	18.9	18.2	21.6	21.6	9.4	4.4			
Seventh	1.9	14.1	19.8	19.4	8.0	12.0	11.4	11.0	3.5		
Eighth	2.9	11.3	9.8	18.1	13.1	14.2	7.7	4.5	8.7	2.6	
Ninth	3.2	10.7	14.3	15.8	13.3	11.3	5.8	11.2	1.7	2.6	
Tenth	3.8	9.3	14.0	6.2	9.3	10.4	11.7	11.3	12.3	5.1	1.8
Eleventh	2.4	6.3	6.8	10.8	8.4	3.2	7.9	6.9	3.5	5.2	3.9
Twelfth	4.4	6.2	13.1	4.5	6.3	2.1	8.0	11.5			4.0

[1] For basic figures see General Table 68, p. 214.

[2] The slight differences which appear between these rates and those shown in Table 68 are due to the omission from this table of a small number of cases in which exclusively artificial feeding was begun but was later changed to partially or exclusively breast feeding.

The contrast was even more striking when the rates for the artificially-fed were compared with those for the exclusively breast-fed babies. Thus, the mortality in the fifth month prevailing among infants who had been fed artificially from the first month or from birth was seven times as high as that prevailing among the breast fed; the mortality among infants who had been fed artificially from the second month was nearly six times, from the third month five and one-half times, and from the fourth month four times as high as among those who had been breast fed from birth, whereas the rate for infants whose artificial feeding commenced in the fifth month was only slightly greater than that for breast-fed babies. The rates in other months of life showed, in general, similar increases with increase in the period of previous artificial feeding. The mortality rate for artificially-fed infants in any month, therefore, was an average of rates for groups of infants who had received artificial and breast feeding for periods of varying length. Other things being equal, the longer the period of previous artificial feeding the higher was the rate, and the longer the period of previous breast feeding the lower the rate.

Not only was the mortality in a given month of life higher among infants who had been artificially fed for longer periods than among infants who had been artificially fed for shorter periods, but the mortality in successive months among infants for whom artificial feeding began in given months increased, relatively to that among breast-fed infants, with the increase in the duration of previous artificial feeding. The first-mentioned effect was due in part, as will be shown later (pp. 96–97), to the fact that the groups of infants who were artificially fed in the early months had more than their due proportions of twins and triplets, for whom mortality rates were especially high. But the increase in the relative mortality within each group of the artificially fed as the duration of artificial feeding increased, which was observed during the first four or five months following the commencement of early artificial feeding, can be explained only as a result of the cumulative effect of the type of feeding. For the infants whose exclusively artificial feeding commenced in the second month, for example, the mortality rate prevailing in that month was 1.7 times the rate for breast-fed infants; the rate for this group in the third month, however, was 5.7 times, and that in the fourth month was 5.9 times the corresponding rate for breast-fed infants. For the infants whose exclusively artificial feeding commenced in the third month the rate was in that month 3.3 times, but in the fourth month 4.7 times and in the fifth month 5.5 times the corresponding rates for breast-fed infants. This increase in the differences between the rates as the length of artificial feeding increased points clearly to the conclusion that the effect of the type of feeding was cumulative.

CAUSES OF DEATH

An analysis of the death rates by cause (as in Table 73) shows, as would be expected, that the excess mortality among the infants who were artificially fed was greatest from gastric and intestinal diseases, the causes most definitely connected with improper feeding. For the period from the second to the ninth month the mortality from these diseases among artificially-fed babies was 11.3

times as great as among exclusively breast-fed babies, but in the tenth, eleventh, and twelfth month period it dropped rapidly to only 3.5 times as great. (See General Table 67, p. 212.) During the entire first year of life the mortality from this group of causes among artificially-fed infants averaged 7.7 times that among breast-fed infants. If the rates from gastric and intestinal diseases prevailing for breast-fed had prevailed also for artificially-fed babies only 64 deaths from these causes would have occurred in the latter group, whereas the number which actually occurred was 495.

Not only were the monthly rates from gastric and intestinal diseases markedly higher, but those from all the other principal causes appear to have been higher for artificially-fed than for breast-fed infants. Among the artificially fed the mortality from respiratory diseases averaged 85 per cent higher, and the rates from malformations and from early infancy were four and six times as high, respectively. From epidemic diseases the mortality was over twice as high. The group of "all other causes," including convulsions, meningitis, and congenital heart disease, had a rate two and one-half times as high, and that of ill-defined causes had a rate nearly five times as high for the artificially-fed as for the breast-fed infants.

TABLE 73.—*Mortality among partly breast-fed and artificially-fed infants as compared with that among breast-fed infants, by cause of death; infants in eight cities*

Cause of death	Deaths of infants—					
	Partly breast fed			Artificially fed		
	Actual	Expected[1]	Ratio of actual to expected	Actual	Expected[1]	Ratio of actual to expected
All causes	269	204.0	1.3	1,047	268.4	3.9
Gastric and intestinal diseases	113	51.9	2.2	495	64.2	7.7
Respiratory diseases	75	82.7	.9	185	100.4	1.8
Malformations	2	3.7	.5	26	5.9	4.4
Early infancy	29	10.6	2.7	165	27.1	6.1
Epidemic and other communicable diseases	20	26.9	.7	74	32.7	2.3
External causes	5	2.2	2.2	3	2.5	1.2
Diseases ill defined and unknown	5	1.4	3.5	18	3.7	4.9
Other causes	20	24.4	.8	81	31.9	2.5

[1] Expected if the rates from each cause that prevailed among breast-fed infants had prevailed among the partly breast-fed and the artificially-fed infants.

The higher monthly rates from "other causes" may have been due to digestive disorders, so far as they were produced by deaths from convulsions following upon gastric and intestinal diseases. Similarly the group of deaths from ill-defined causes may have included many from digestive diseases. Even under the group of causes peculiar to early infancy, especially in case of deaths classified as from "congenital debility," many deaths may have been included which were largely the result, and fairly to be ascribed to the effect, of improper feeding; for this term, according to the rules of classification in use by the Bureau of the Census, includes all deaths under 1 year reported as due to such vague causes as debility, marasmus, emaciation, malassimilation—conditions which, when they appear

after the first or second month of life, are probably often due to improper feeding or to digestive disorders.

In this connection it may be noted that the mortality from congenital debility from the second to the twelfth month among artificially-fed infants was 10.7 times that among breast-fed infants, the rate from this cause corresponding closely with the excess mortality from gastric and intestinal diseases. On the other hand, in the first month the mortality from this cause among the artificially-fed infants was only 3.1 times that among breast-fed infants.

Although part of the excess mortality from congenital debility appearing among the artificially fed was probably due to inaccurate reports as to the cause of death, the considerable excess in their mortality from other causes peculiar to early infancy, including premature birth and injuries at birth and malformations, can be explained only on the hypothesis that infants who were physically weak were more likely to be artificially fed than were more robust infants. The fact that such a tendency existed would not affect the conclusion, of course, that the chances of life of these infants were greater if they were breast fed than if they were artificially fed.

When the mortality among the partly breast-fed was compared with that among the wholly breast-fed babies, a notably higher death rate from gastric and intestinal diseases was found to prevail among the former. The mortality among the partly breast-fed, though by no means so marked as that among the artificially-fed, was 2.2 times that among the exclusively breast-fed infants. Evidently while partial breast feeding afforded some protection against these diseases, it did not afford the same amount of protection as exclusively breast feeding.

The mortality among the partly breast-fed from causes peculiar to early infancy, also, was over twice as high as that among the wholly breast-fed infants. For other causes of death the figures are too small to be significant.

PLURAL BIRTHS, PREMATURITY, AND DEATH OF MOTHER

Evidence has already been presented to show that twins and triplets, prematurely born infants, and babies whose mothers died within the year were characterized by high mortality rates from all causes and especially from causes peculiar to early infancy. Since artificial feeding was especially prevalent among these infants, the group of artificially fed was unfavorably weighted with babies belonging to these groups in which the mortality rates from causes other than feeding were exceptionally high. (See pp. 35, 75 and 80–81, and General Tables 49 and 9, pp. 205, 190.) Of the infants who were artificially fed in the first month 5.5 per cent were twins and triplets as compared with only 1.6 per cent of those who were breast fed in the first month. Similarly in the former group 8.2 per cent were premature as compared with only 3.1 per cent in the latter. And in the former 2.8 per cent were infants whose mothers died within the year as compared with only 0.3 per cent in the latter. (Compare General Tables 67 and 8, 48, and 58, pp. 212, 189, 205, 208.)

Of the months lived from birth to the ninth by infants while artificially fed 3.3 per cent were lived by twins and triplets, 4.6 per cent by prematurely born babies, and 1.4 per cent by babies whose mothers died within one year after confinement, as compared with 1.1 per

cent, 2.4 per cent, and 0.1 per cent, respectively, of the months lived by infants while breast fed. (Compare General Tables 49 and 9, pp. 209 and 190.)

In the entire group of infants the rates for the artificially fed averaged 3.9 times those for the breast fed. Among the twins and triplets, according to Table 74, the mortality of the artificially fed averaged 3.6 times, and among the single-born babies it averaged 3.8 times, as high as among the breast-fed infants. Thus if the rates for the single and plural breast fed had applied, respectively, to the single and plural artificially fed, instead of 1,047 deaths only 279.2 would have occurred in the entire group of artificially-fed infants. In other words, the mortality among artificially-fed averaged 3.75 times that among breast-fed infants even after the influence of the overweighting of the former group by twins and triplets was eliminated.

TABLE 74.—*Mortality among artificially-fed as compared with that among breast-fed infants, when influence of plural births, prematurity, and death of mothers is eliminated; infants in eight cities*

Single and plural births, term, death of mothers	Deaths of infants artificially fed								
	Actual	Expected at average rates for breast-fed infants in corresponding months		Expected at average rates for breast-fed infants in corresponding months—					
				In each specified group		For single and plural births of same term		For single and plural births of same term to mothers who died and to mothers who survived the year	
		Number	Ratio [1]	Number	Ratio [1]	Number	Ratio [1]	Number	Ratio [1]
Total	1,047	268.57	3.90	279.16	3.75	304.40	3.44	320.23	3.27
Single	963			256.01	3.76	279.29	3.45	295.12	3.26
Full term	851					228.48	3.72	241.49	3.52
Premature	112					50.81	2.20	53.63	2.09
Plural	84			23.15	3.63	25.11	3.35	25.11	3.35
Full term	67					15.36	4.36	15.36	4.36
Premature	17					9.75	1.74	9.75	1.74
Total	1,047			293.95	3.56				
Full term	918			235.60	3.90				
Premature	129			58.35	2.21				
Total	1,047			283.61	3.69				
Mothers died	34			20.27	1.68				
Mothers survived the year	1,013			263.34	3.85				

[1] Ratio of actual to expected.

The effect of eliminating the influence of the other factors was also found to be relatively slight. When the effect of the overweighting of the artificially-fed group by prematurely born infants was eliminated, the ratio of mortality among the artificially-fed to that among breast-fed infants was reduced only from 3.90 to 3.56; and similarly when the influence of the overweighting by infants whose mothers died was eliminated, the ratio was reduced only from 3.90 to 3.69.

Since a much larger proportion of plural than of single births were premature, the reduction in the ratio between the number of deaths in the two groups resulting from eliminating the influence of prematurity may in part duplicate that resulting from eliminating the influence of plural birth. Nevertheless, when the influence of both these factors was eliminated, the ratio was reduced only from 3.90 to 3.44. When the influence of all three factors was eliminated, regardless of overlapping of the groups, the mortality among artificially-fed infants still averaged 3.27 times that among breast-fed infants.

This analysis shows clearly that the effect of the overweighting of the group of artificially fed by infants belonging to groups which had high mortality rates was of minor importance as compared with the marked excess mortality associated directly with the kind of feeding.

Reference has already been made to the influence which the tendency to feed artificially infants in certain groups characterized by high mortality rates in larger proportions or beginning at earlier ages than other infants may have had in increasing the apparently cumulative effect of the type of feeding. Of the infants who were artificially fed beginning in the first month 12.4 per cent either were prematurely born or were twins or triplets, as compared with an average of 7.3 per cent of those for whom artificial feeding began in the second and third, 5 per cent of those for whom it began in the fourth to the seventh, and only 3.8 per cent of those for whom it began in the eighth to the twelfth month.

Table 75 shows the monthly death rates for groups that were not affected by this influence—the artificially-fed, single-born infants who were born at term and whose mothers lived throughout the year following their birth, classified according to the month when artificial feeding commenced. The effect of eliminating the three groups previously discussed was to reduce materially the ratio between the mortality among infants who had been artificially fed from the first month and that among infants whose artificial feeding commenced later. This elimination, however, did not alter the general conclusion previously reached. In the fifth month, for example, the rate of infant mortality was higher the longer the period of previous artificial feeding. The tendency already noted in the entire group for the rate to increase relatively to that for breast-fed infants immediately following the beginning of artificial feeding at an early age was found to be present also in this group of infants. Among the infants whose exclusively artificial feeding commenced in the second month, for example, a mortality prevailed in that month which was 1.9 times that among breast-fed infants; the rate in the third month, however, was 6.3 times, in the fourth 5.6 times, and in the fifth 6.9 times, the corresponding rate for breast-fed infants. Among the infants whose exclusively artificial feeding commenced in the third month, the mortality in that month was 3.9 times, in the fourth month 5 times and in the fifth 6.1 times, the corresponding mortality among breast-fed infants. In fact, the elimination of the group of premature and plural babies and of infants whose mothers died within one year after their birth appeared not to weaken but even to strengthen the evidence that the type of feeding had a cumulative effect during the early months of life.

TABLE 75.—*Monthly death rates, by duration of previous artificial feeding; single-born, full-term infants in eight cities whose mothers survived the first year after confinement* [1]

Month of life	Monthly death rates of infants [2]—		Monthly death rates of infants artificially fed from [2]—								
	Exclusively breast fed	Exclusively artificially fed	First month	Second month	Third month	Fourth month	Fifth month	Sixth month	Seventh month	Eighth month	Ninth and later months
First	11.7	32.2	32.2								
Second	4.9	20.3	27.4	9.3							
Third	3.4	17.9	18.2	21.3	13.3						
Fourth	3.1	17.6	28.1	17.4	15.6	1.0					
Fifth	2.9	17.0	21.4	20.3	17.9	12.3	2.0				
Sixth	1.9	17.2	18.3	18.1	21.5	19.7	9.9	4.7			
Seventh	1.8	12.7	15.6	19.3	8.8	10.6	12.0	9.4	3.7		
Eighth	3.0	8.6	9.8	11.2	7.7	10.7	6.1	4.7	7.4	2.7	
Ninth	3.2	9.8	12.3	13.3	13.4	11.9	6.1	11.9		2.7	
Tenth	3.4	8.8	12.5	4.8	10.2	10.9	10.2	9.6	13.0	5.3	1.9
Eleventh	2.5	6.4	6.3	11.6	8.0	3.3	8.3	7.3	3.8	5.4	4.0
Twelfth	4.5	5.7	11.5	3.9	6.9	2.2	6.3	12.3			4.2

[1] For basic figures see General Table 69, p. 215.
[2] Omitting prematurely born infants, twins and triplets, and infants whose mothers died at or within one year after confinement.

COLOR AND NATIONALITY OF MOTHER

The differences in the prevalence of breast and artificial feeding in the several race and nationality groups are discussed in detail in the next section. An answer to the question as to whether the mortality in the group of artificially fed was raised unduly by the inclusion within it of a disproportionate number of infants belonging to nationalities which had high mortality rates is given in Table 76. The table shows, in fact, that of the months lived from birth to the end of the ninth a slightly smaller proportion (30.7 per cent) of the months of artificial feeding than of those either of wholly or of partly breast feeding (31.2 per cent and 34.2 per cent, respectively) were lived by infants of nationality groups having higher than average mortality rates. The proportion was greatest in the case of the months lived by infants while partly breast fed.

When allowance was made in Table 77 for the differences in prevalence of artificial feeding in the several nationality groups, the ratio of the mortality of the artificially-fed to that of the breast-fed infants was slightly, but only very slightly, increased—from 3.9 to 4. The correction for nationality, therefore, did not appreciably affect the conclusion that artificial feeding was attended by a much greater mortality than breast feeding.

When a similar allowance was made in the case of partly breast feeding, on the other hand, the ratio of the mortality of the partly breast-fed to that of the breast-fed infants was slightly reduced from 1.32 to 1.30.

TABLE 76.—*Proportion of months to the end of the ninth lived by infants of mothers of nationalities with high infant mortality rates, by type of feeding; infants in eight cities*

Type of feeding	Months lived to end of ninth—		
	Total	By infants of mothers of nationalities with high infant mortality rates [1]	
		Number	Per cent
Total	192,212.5	60,754.0	31.6
Breast	110,384.0	34,418.0	31.2
Partly breast	33,904.5	11,598.0	34.2
Artificial	47,842.0	14,697.5	30.7
Not reported	82.0	40.5	49.4

[1] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored.

TABLE 77.—*Mortality among partly breast-fed and exclusively artificially-fed as compared with breast-fed infants, by color and nationality of mother; infants in eight cities*

Color and nationality of mother	Deaths among infants—					
	Partly breast fed			Artificially fed		
	Actual	Expected	Ratio	Actual	Expected	Ratio
Total	269	207.7	1.3	1,047	261.2	4.0
White	240	172.4	1.4	963	234.6	4.1
Native	91	53.3	1.7	503	94.1	5.3
Foreign born	149	119.1	1.3	460	140.5	3.3
Italian	17	19.8	.9	30	13.7	2.2
Jewish	6	12.8	.5	16	5.5	2.9
French-Canadian	19	10.4	1.8	95	39.4	2.4
German	8	6.4	1.3	35	6.2	5.6
Polish	39	24.4	1.6	60	12.3	4.9
Portuguese	24	10.1	2.4	73	17.0	4.3
Other	36	35.2	1.0	151	46.4	3.3
Colored	29	35.3	.8	84	26.6	3.2

The ratios between the mortality among artificially-fed and partly breast-fed infants and that among breast-fed infants varied considerably from group to group. The mortality among artificially fed was only 2.2 times that among breast fed in the Italian group, in which both rates were relatively low; for the native white the ratio was 5.3, and for the German it was 5.6.

EMPLOYMENT OF MOTHER DURING FIRST YEAR OF INFANT'S LIFE

A much larger proportion of the months both of partly breast feeding and of artificial feeding than of those of breast feeding, as Table 78 shows, were lived by infants whose mothers were employed away from home—7 per cent and 7.4 per cent, as compared with 0.9 per cent. The highest of these percentages, however, was not large; and although the babies whose mothers were thus employed had a markedly higher

mortality than other babies, the excess in the mortality among them, as will be shown later, was due in considerable part to the prevalence of artificial feeding. So far as the mortality among the artificially fed, as compared with that among the breast fed is concerned, therefore, this disproportionate weighting of the group of artificially fed with infants of mothers employed away from home could not have materially affected the ratio.

TABLE 78.—*Relative weighting of type-of-feeding groups by infants in eight cities whose mothers were employed away from home*

Type of feeding	Months lived to end of ninth—		
	Total	By infants whose mothers were employed away from home	
		Number	Per cent [1]
Total	192,212.5	6,891.0	3.6
Breast	110,384.0	977.5	0.9
Partly breast	33,904.5	2,360.0	7.0
Artificial	47,842.0	3,540.0	7.4
Not reported	82.0	13.5	

[1] Not shown where base is less than 100.

EARNINGS OF FATHER

The question whether the high mortality among the artificially fed was in part a reflection of a disproportionate weighting of this group with infants of fathers whose earnings were low—a group in which mortality rates were higher than the average—is an important one. The answer is given in Table 79, which shows that, on the contrary, the group of artificially fed had the smallest proportion of infants in the low-earnings group; i. e., in the group born in families in which the fathers earned during the year following the birth less than $650. Of the months lived from birth up to the end of the ninth the proportion lived by infants in families in which the fathers' earnings were under $650 was lowest (37.6 per cent) for the months of artificial feeding, and highest (48.7 per cent) for the months of partly breast feeding.

When allowance was made for this tendency, as in Table 80, the relative mortality among artificially-fed, as compared with breast-fed infants, was slightly increased. It has already been stated (p. 90) that for the first nine months of life this ratio was 4.80; when the data for one city for which earnings were not exactly comparable with the others were omitted the ratio was raised to 5.17. When allowance was made for the negative correlation between artificial feeding and earnings, as in Table 80, the ratio of the rates was raised from 5.17 only to 5.24. The correction resulting from this correlation was thus seen to be relatively slight.

The correction for the correlation between earnings and partly breast feeding, on the other hand, worked in the opposite direction.

When allowance was made for this correlation, the ratio of the mortality among partly breast-fed to that among breast-fed infants during the first nine months was reduced from 2.03 to 1.93.

TABLE 79.—*Proportion of months to the end of the ninth lived by infants in families in which the father earned less than $650, by type of feeding; infants in seven cities*

Type of feeding	Months lived from birth to end of ninth—		
	Total	By infants in families in which father earned less than $650	
		Number	Per cent[1]
Total	180,412.0	75,364.5	41.8
Breast	102,768.5	42,683.5	41.5
Partly breast	31,412.0	15,287.5	48.7
Artificial	46,149.5	17,362.5	37.6
Not reported	82.0	31.0	

[1] Not shown where base is less than 100.

TABLE 80.—*Mortality among artificially-fed and among partly breast-fed infants as compared with that among exclusively breast-fed infants, by earnings of father; infants in seven cities*

Earnings of father	Deaths to end of ninth month among infants—					
	Partly breast fed			Artificially fed		
	Actual	Expected[1]	Ratio	Actual	Expected[1]	Ratio
Total	186	96.5	1.9	829	158.1	5.2
Under $550	81	39.2	2.1	315	49.8	6.3
$550–$849	64	34.0	1.9	313	62.6	5.0
$850–$1,249	20	13.0	1.5	118	26.5	4.5
$1,250 and over	7	3.2	2.2	32	7.8	4.1
No earnings	8	3.1	2.6	32	5.2	6.1
Not reported	6	4.1	1.5	19	6.3	3.0

[1] Expected if rates that prevailed among breast-fed infants in the same months of life and in the same earnings group had prevailed among partly breast-fed and artificially-fed infants.

The ratio of the mortality of artificially-fed infants to that of breast-fed infants in each of the principal earnings groups is also shown in Table 80. The ratio was much higher (6.3) for the group with earnings under $550 than for that with earnings $1,250 and over (4.1). This contrast between the ratios probably corresponds to differences in the types of artificial feeding or to differences in the care with which feeding was given in the various earnings groups.

VARYING PREVALENCE OF EARLY ARTIFICIAL FEEDING

Reasons for the varying prevalence of early artificial feeding among different groups of infants include those based upon the physical condition of mother or child, those based upon inability of the mother to nurse, and those based upon social customs. Probably a consider-

able proportion of the prematurely born infants had to be artificially fed because they were too weak to nurse. This may have been the case with many of the twins and triplets, of whom, also, a large proportion may have been weaned because of the inability of their mothers to nurse them. Among cases in which infants were reported to have been weaned at an early age on account of the mothers' inability to nurse them it was of course impossible to distinguish between those in which such inability actually existed and those in which with proper care and diet the mothers could have succeeded in nursing their babies. The analysis of the varying prevalence of artificial feeding among the babies of different orders included in this study suggested that the first infants and those tenth and later in order may have been under some special handicap in regard to the possibility of breast feeding, owing either to their own physical condition or to their mothers' inability to nurse them. The babies born to older mothers appear also to have been under a handicap (pp. 45 and 54–55).

The customs and traditions of nationality groups, as modified by environmental influences, were undoubtedly the principal factor in the variations in methods of feeding. The prevalence of artificial feeding among the French-Canadian and of breast feeding among the Jewish families can be accounted for only as a result of differences in nationality customs. A campaign of education inculcating right methods of feeding might, therefore, have reduced very materially the prevalence of early artificial feeding and thereby reduced materially the high infant mortality rates that characterized those groups in which large proportions of infants were artificially fed.

Another important factor in the prevalence of artificial feeding was the employment of the mother away from home. Such employment usually required the mother to be absent from home for the greater part of the day, and in a large proportion of these cases the mothers did not attempt breast feeding for their babies after they resumed work.

SUMMARY

The artificial feeding of infants, when commenced in the early months of life, was associated with a mortality between three and four times that found to prevail among breast-fed infants. This excess was not explained by the slight overweighting of the group of artificially fed with twins and triplets, prematurely born infants, and babies whose mothers died during the year, all of whom were characterized by high rates. The excess appeared in all nationality and earnings groups, though with variations depending upon particular conditions. Early artificial feeding appeared to have been especially hazardous. Furthermore, such feeding appeared to have resulted in an increasing difference, for the first few months after it was begun, between the mortality among the artificially-fed and that among the breast-fed infants. Artificial feeding which commenced during the last three or four months of the first year of life, however, seems not to have been associated with any excess hazard, but on the contrary, to have resulted in a slightly lower mortality than that prevailing among infants breast fed during that period.

COLOR AND NATIONALITY OF MOTHER

In order that the influence of race and nationality upon their mortality might be studied the infants in the eight cities were classified according to their mothers' race (whether colored or white) and nativity, and those whose mothers were foreign born were classified according to the mothers' nationality (mother tongue). The nationality of the mother was selected for tabulation instead of that of the father on the ground not only that the infant's vitality depends in large part upon the mother's health and condition during pregnancy but also that the care received by the infant depends upon the mother's condition during his first year of life and to some extent upon the traditions and customs of the nationality to which the mother belongs. In particular, the type of feeding is influenced by the nationality traditions and customs as to maternal nursing. Though the customs and traditions of the father's nationality, also, in the comparatively few cases in which it differed from that of the mother,[1] may also have influenced the child's welfare, it is probable that the influence of such factors is exerted principally through the relation, if any, which nationality bears to earnings.

Nationality, it is evident, exerted its influence partly through differences in physical vitality and partly through differences in type of feeding, father's earnings, and other environmental factors.

TABLE 81.—*Infant mortality rates, by cause of death and color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births	Infant deaths	Infant mortality rates from specified causes					
			All causes	Gastric and intestinal diseases	Respiratory diseases	Early infancy	Epidemic diseases	Other causes
Total	22,967	2,555	111.2	32.4	19.6	36.1	7.1	16.1
White	21,510	2,330	108.3	32.6	17.9	35.1	6.4	16.4
Native	12,102	1,135	93.8	25.2	13.0	36.1	5.4	14.1
Foreign born	9,408	1,195	127.0	42.2	24.2	33.7	7.7	19.2
Italian	1,426	148	103.8	21.7	27.3	33.7	7.7	13.3
Jewish	1,233	66	53.5	10.5	8.9	22.7	4.9	6.5
French-Canadian	1,074	184	171.3	64.2	25.1	44.7	6.5	30.7
German	776	80	103.1	27.1	18.0	30.9	11.6	15.5
Polish	1,266	199	157.2	64.0	33.2	38.7	3.9	17.4
Portuguese	669	134	200.3	101.6	50.8	20.9	14.9	12.0
Other	2,962	384	129.6	38.5	20.6	35.8	8.1	26.7
Not reported	2							
Colored	1,457	225	154.4	28.1	44.6	52.2	17.2	12.4

The infant mortality rates for the different race and nationality groups, which are given in Table 81, showed marked variations. The rate for colored was decidedly higher than that for white infants—154.4 as compared with 108.3. The group of infants of foreign-born

[1] In one city for which a special tabulation of this point was made, 1,911 infants out of 2,197 (87 per cent) had fathers and mothers of the same race and nationality group.

mothers had a considerably higher rate (127) than white babies whose mothers were born in this country (93.8). Among the foreign nationalities wide differences were found. The lowest rate was 53.5, for infants of Jewish mothers—a markedly lower mortality than that in the native white group. The highest rate (200.3) was found for babies whose mothers were Portuguese. The infants of German and Italian mothers had relatively low rates—103.1 and 103.8, respectively; and those of Polish and French-Canadian mothers had relatively high rates—157.2 and 171.3, respectively.

CAUSES OF DEATH OF INFANT

The analysis by cause of death, also given in Table 81, showed that with two or three exceptions the nationalities held about the same relative rank in the mortality from each cause as in that from all causes. The infants of Jewish mothers, for example, who had the lowest rate from all causes, had much the lowest also from gastric and intestinal and from respiratory diseases and next to the lowest from causes peculiar to early infancy and from epidemic diseases. In the native white group, which had next to the lowest rate from all causes, the mortality was distinctly below the average from gastric and intestinal diseases, from respiratory diseases, and from epidemic diseases, and was equal to the average from causes peculiar to early infancy. The infants of German mothers had rates below average except from epidemic diseases. In the Italian group the mortality was below average except from epidemic and from respiratory diseases; from gastric and intestinal diseases it was next to the lowest. The infants of Polish and French-Canadian mothers had death rates from gastric and intestinal diseases that were twice as high, and those of Portuguese mothers a rate from these causes that was over three times as high, as the average. In these three groups the mortality from respiratory diseases was markedly above the average; their rates from other causes were also high, except that the Portuguese had the lowest mortality of all from causes peculiar to early infancy and the Polish the lowest of all from epidemic diseases.

NEONATAL MORTALITY

The death rates for the different nationalities during the first month of life, given in Table 82, showed, with a single exception, variations similar to those found in the mortality from causes peculiar to early infancy.[2] The neonatal rate was lowest (28.4) for infants of Jewish mothers, and the rate from causes peculiar to early infancy was lowest for infants of Portuguese mothers. The Portuguese neonatal mortality rate, on the other hand, was 40.4—only slightly lower than the general average, 44.8. Deaths during the first month among infants of Portuguese mothers were charged in a large proportion of cases to gastric and intestinal diseases; practically all those among infants of Jewish mothers were charged to causes peculiar to early infancy. This marked difference in the positions of the Jewish and Portuguese groups, in relation to each other and to the general average, in respect to neonatal mortality and to deaths from causes peculiar to early

[2] For rates in later months see General Table 70, p. 215.

infancy suggests inaccuracies in reporting cause. On the other hand, the peculiar customs of early infant feeding found among the Portuguese, who frequently gave "sopa," a soup containing softened crackers, to babies a few hours old, may perhaps account for the occurrence in this group of a particularly large number of deaths from gastric and intestinal diseases at ages under 1 month.

TABLE 82.—*Neonatal mortality rates, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births	Deaths under 1 month	Neonatal mortality rates
Total	22,967	1,028	44.8
White	21,510	934	43.4
Native	12,102	502	41.5
Foreign born	9,408	432	45.9
Italian	1,426	66	46.3
Jewish	1,233	35	28.4
French-Canadian	1,074	58	54.0
German	776	33	42.5
Polish	1,266	66	52.1
Portuguese	669	27	40.4
Other	2,962	147	49.6
Not reported	2		
Colored	1,457	94	64.5

PLURAL BIRTHS AND PREMATURITY

The prevalence of twins and triplets, according to Table 83, did not vary significantly in the different nationality groups, with the possible exception of the Jewish and the Portuguese. The Jewish group had the highest proportion of twins and triplets (3 per cent) and the Portuguese had the lowest (1.6 per cent); the average for all nationalities was 2.3 per cent.

Table 84 shows that the prevalence of premature births, on the other hand, varied markedly. Prematurity occurred more frequently among infants born to native white than among those born to foreign or to colored mothers. Among babies of Portuguese mothers the proportion reported premature was especially low.

The influence of these variations in prevalence of premature births in the different nationality groups upon the infant mortality rates for these groups was relatively slight. The high proportion of births to native white mothers which were premature tended to increase both the rate from causes peculiar to early infancy and the neonatal rate; but in spite of this high proportion of premature births the neonatal mortality rate for infants of native white mothers was below the average, the rate from causes peculiar to early infancy was equal to the average, and that from all causes was markedly below the average for the entire group.

TABLE 83.—*Proportion of plural births, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births		
	Total	Plural births	
		Number	Per 1,000 live births
Total	22,967	529	23.0
White	21,510	496	23.1
Native	12,102	284	23.5
Foreign born	9,408	212	22.5
Italian	1,426	36	25.3
Jewish	1,233	37	30.0
French-Canadian	1,074	22	20.5
German	776	16	20.6
Polish	1,266	28	22.1
Portuguese	669	11	16.4
Other	2,962	62	20.9
Not reported	2		
Colored	1,457	33	22.7

TABLE 84.—*Proportion of premature births, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births		
	Total	Premature births	
		Number	Per cent
Total	22,967	1,158	5.0
White	21,510	1,076	5.0
Native	12,102	742	6.1
Foreign born	9,408	334	3.6
Italian	1,426	56	3.9
Jewish	1,233	41	3.3
French-Canadian	1,074	65	6.1
German	776	27	3.5
Polish	1,266	38	3.0
Portuguese	669	10	1.5
Other	2,962	97	3.3
Not reported	2		
Colored	1,457	82	5.6

DEATH OF MOTHER

In Table 85 the proportion of births to mothers who died at or within one year after confinement is shown for the several nationalities. The proportion was low in the Jewish, Polish, and Italian groups, high in the native white and the German, and highest in the colored. However, the number of infants affected by the adverse conditions following in the train of their mothers' deaths was relatively very small, and the influence of this factor in causing differences in mortality rates in the several nationality groups therefore appeared negligible. Thus in the colored group, in which the proportion of

births to mothers who died was nearly twice that in the group with foreign-born mothers, deaths of infants whose mothers died numbered only seven; so that if the proportion of births to mothers who died had been half as great as it was, the difference of three or four in the total number of infant deaths in the group would have made but little difference in the relative mortality rates for the infants of colored and of foreign-born mothers.

TABLE 85.—*Proportion of births to mothers who died at or within one year after confinement, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births—		
	Total	To mothers who died at or within one year after confinement	
		Number	Per 1,000
Total	22,967	140	6.1
White	21,510	129	6.0
Native	12,102	84	6.9
Foreign born	9,408	45	4.8
Italian	1,426	6	4.2
Jewish	1,233	2	1.6
French-Canadian	1,074	6	5.6
German	776	5	6.4
Polish	1,266	4	3.2
Portuguese	669	4	6.0
Other	2,962	18	6.1
Not reported	2		
Colored	1,457	11	7.5

PLURAL BIRTHS, PREMATURITY, AND DEATH OF MOTHER

The three factors, plural birth, premature birth, and death of the mother at or within one year after confinement, taken together, were present in almost equal proportions of the cases in the different nationality groups, as Table 86 shows. With the exception of the Polish, Portuguese, and "other foreign-born" groups, in which only 4.9, 3.3, and 5.6 per cent, respectively, of the infants were subjected to the influence of one or another of these three factors, the differences in these proportions among the several nationality groups were confined within a range of less than 2.5 per cent. The variations found, moreover, tended toward an equalization of the death rates for the different nationality groups. Thus the Portuguese, with the most favorable proportion of births in these "handicapped" groups, had nevertheless the highest mortality; and the infants of native white mothers, with the most unfavorable proportion of births in these handicapped groups, had a mortality rate that was well below the average.

TABLE 86.—*Proportion of plural or premature births or births to mothers who died at or within one year after confinement, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births		
	Total	Plural or premature births or births to mothers who died at or within one year after confinement	
		Number	Per cent
Total	22,967	1,675	7.3
White	21,510	1,562	7.3
Native	12,102	1,019	8.4
Foreign born	9,408	543	5.8
Italian	1,426	87	6.1
Jewish	1,233	75	6.1
French-Canadian	1,074	84	7.8
German	776	48	6.2
Polish	1,266	62	4.9
Portuguese	669	22	3.3
Other	2,962	165	5.6
Not reported	2		
Colored	1,457	113	7.8

INSTRUMENTAL DELIVERY

Instrumental delivery, as Table 87 shows, was more common among native white mothers, 9.2 per cent of whom were thus delivered, than among those of any other group.[3] The lowest proportion of births with instrumental delivery (3.1 per cent) was found for the Polish mothers. These differences correspond fairly closely, as will be shown later, to differences in economic status.

TABLE 87.—*Instrumental delivery, by color and nationality of mother; confinements in Baltimore*

Color and nationality of mother	Confinements		
	Total	Instrumental delivery	
		Number	Per cent
Total	11,463	866	7.6
White	9,974	819	8.2
Native	7,117	654	9.2
Foreign born	2,857	165	5.8
Jewish	996	67	6.7
Polish	646	20	3.1
Italian	435	26	6.0
Other	780	52	6.7
Colored	1,489	47	3.2

[3] These statements are based upon data for Baltimore only.

FREQUENCY OF BIRTHS

Age of mother.

Among the different nationality groups comparatively slight differences were found in the percentages of births to mothers of ages for which the infant mortality rates were above average; namely, births to mothers under 20 and to those 35 years of age and over. According to Table 88 the proportion of such births was highest for the German (30.4 per cent) and lowest for the Polish group (19 per cent). With the exception of the percentages for the German, French-Canadian, and colored groups, the variations were confined within a range of less than 5 per cent. One reason for the relatively slight differences was the tendency for a low proportion of births to mothers under 20 to be offset by a high proportion to those over 35, and for a high proportion to mothers under 20 to be offset by a low proportion to those over 35 years of age.

These differences did not in all cases correspond with variations in mortality. For example, the Polish and Portuguese groups, though having high death rates, had low proportions of babies born to mothers of these ages, and the German, though having a relatively low death rate, had the highest proportion of babies born to such mothers. On the other hand, the mortality among the Jewish infants tended to be lessened by a low percentage, and that among the French-Canadian infants tended to be raised by a high percentage, of babies whose mothers belonged to age divisions which had high death rates.

TABLE 88.—*Proportion of births to mothers under 20 and to those 35 years of age and over, by color and nationality of mother; live births in eight cities* [1]

Color and nationality of mother	Live births—		
	Total	To mothers under 20 and 35 years of age and over	
		Number	Per cent
Total	22,967	5,230	22.8
White	21,510	4,848	22.5
Native	12,102	2,658	22.0
Foreign born	9,408	2,190	23.3
Italian	1,426	337	23.6
Jewish	1,233	250	20.3
French-Canadian	1,074	313	29.1
German	776	236	30.4
Polish	1,266	241	19.0
Portuguese	669	147	22.0
Other	2,962	666	22.5
Not reported	2		
Colored	1,457	382	26.2

[1] For basic figures see General Table 23, p. 195.

Order of birth.

Table 89 gives the prevalence of births of orders for which the mortality rates were above average, by nationality of the mothers. The proportions of infants of the fifth and later orders—those for which the rates were above average—ranged from 19 per cent for babies of native white mothers to 42.6 per cent for those of French-Canadian mothers. The percentages for the foreign-born groups had

a much narrower range—from 28.3 for the "other foreign-born" to 42.6 per cent for the French-Canadian group.

When allowance was made in Table 90 for this variation in the proportions of births of various orders, however, little change was made in the relative mortality by nationality. The mortality of babies of French-Canadian mothers was diminished slightly and that of babies of native white mothers raised slightly relatively to the rates in other groups.

TABLE 89.—*Proportion of births fifth and later in order, by color and nationality of mother; live births in eight cities* [1]

Color and nationality of mother	Live births—		
	Total	Fifth and later in order	
		Number	Per cent
Total	22,967	5,974	26.0
White	21,510	5,462	25.4
Native	12,102	2,294	19.0
Foreign born	9,408	3,168	33.7
Italian	1,426	540	37.9
Jewish	1,233	406	32.9
French-Canadian	1,074	457	42.6
German	776	255	32.9
Polish	1,266	440	34.8
Portuguese	669	231	34.5
Other	2,962	839	28.3
Not reported	2		
Colored	1,457	512	35.1

[1] For basic figures see General Table 31, p. 198.

TABLE 90.—*Relative mortality, by color and nationality of mother, when influence of order of birth is eliminated; live births in eight cities*

Color and nationality of mother	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,555	2,555.2	100.0
White	2,330	2,387.4	97.6
Native	1,135	1,312.9	86.4
Foreign born	1,195	1,074.5	111.2
Italian	148	164.4	90.0
Jewish	66	138.9	47.5
French-Canadian	184	129.3	142.3
German	80	89.1	89.8
Polish	199	145.0	137.2
Portuguese	134	77.2	173.6
Other	384	330.4	116.2
Not reported		0.2	
Colored	225	167.8	134.1

[1] Expected at average rates by order of birth, irrespective of mother's nationality.

Interval since preceding birth.

Except for the very low percentage for the Jewish group (16.4) comparatively little variation in the proportion of births following

preceding births at short intervals was found for the several nationalities.[4] According to Table 91 the highest proportion (33.5 per cent) was in the colored group and the lowest (23.6 per cent) in the German except for the very low figure of 16.4 per cent in the Jewish. Table 92 shows how the positions of the different nationalities were affected when allowance was made for the variations in the proportion of short-interval births. It is noteworthy that the mortality of Jewish infants still appears very favorable as compared with other nationalities even after due account is taken of the unusually low proportion of infants born at short intervals after preceding births.

TABLE 91.—*Proportion of short-interval births,[1] by color and nationality of mother; live births in Baltimore second and later in order [2]*

Color and nationality of mother	Live births second and later in order—		
	Total	Following preceding births at short intervals [1]	
		Number	Per cent [3]
Total	7,929	2,072	26.1
White	6,855	1,712	25.0
Native	4,606	1,174	25.5
Foreign born	2,249	538	23.9
Italian	356	111	31.2
Jewish	793	130	16.4
German	259	61	23.6
Polish	515	146	28.3
Other	326	90	27.6
Colored	1,074	360	33.5

[1] For definition of interval see p. 60.
[2] For basic figures see General Table 37, p. 200.
[3] Not shown where base is less than 100.

TABLE 92.—*Relative mortality, by color and nationality of mother, when influence of interval since preceding birth is eliminated; live births in Baltimore second and later in order*

Color and nationality of mother	Infant deaths		
	Actual	Expected [a]	Ratio of actual to expected (per cent)
Total	845	844.6	100.0
White	675	725.3	93.1
Native	465	488.2	95.2
Foreign born	210	237.1	88.6
Italian	31	39.3	78.9
Jewish	34	79.6	42.7
German	24	27.1	88.6
Polish	82	56.1	146.2
Other	39	35.0	111.4
Colored	170	119.3	142.5

[a] Expected at average rates by interval for second and later births irrespective of nationality of mother.
[4] The data on interval were limited to Baltimore. For definition of short interval see p. 60.

Interval before succeeding pregnancy.

According to Table 93, the proportion of births to mothers who became pregnant during the infant's first year of life varied from 7.9 per cent in the Jewish to 25.2 per cent in the Italian group. These percentages, however, tend to overstate the importance of this factor, since the proportions of the time lived by infants after their mothers had become pregnant to the total time lived by all infants were much smaller (p. 68). Though the differences were not large enough to account for any great variation in the mortality rates in the several groups, the Jewish infants again seem to have had the most favorable conditions.

TABLE 93.—*Proportion of births to mothers who became pregnant before end of first year of infant's life, by color and nationality of mother; live births in Baltimore*

Color and nationality of mother	Live births—		
	Total	To mothers who became pregnant during first year of infant's life[1]	
		Number	Per cent
Total	10,797	1,232	11.4
White	9,492	1,037	10.9
Native	6,739	662	9.8
Foreign born	2,753	375	13.6
Jewish	961	76	7.9
Polish	625	106	17.0
Italian	412	104	25.2
Other	755	89	11.8
Colored	1,305	195	14.9

[1] Omitting cases in which infant died in month in which mother became pregnant.

TYPE OF FEEDING

Marked differences were found in the customs of the different nationality groups in respect to types of feeding. Of the months lived from birth to the end of the ninth the infants of Italian mothers had the largest proportion—68.6 per cent—of months of exclusively breast feeding. They were followed closely by the infants of Polish mothers with 65.9 per cent and by those of Jewish mothers with 61.5 per cent. The lowest proportion (42.7 per cent) was that of the French-Canadian group. (See General Tables 71 and 72, p. 216.)

The greatest prevalence of artificial feeding, on the other hand, was found, according to Table 94, in the French-Canadian group; the infants of French-speaking mothers born in Canada were fed artificially during 44 per cent of the months which they lived from birth to the end of the ninth. The Portuguese group came next with 31.9 per cent, followed by the native white with 28.3 per cent. The lowest proportions were those of the infants of Jewish and of Polish mothers—11.3 and 11.1 per cent, respectively.

Since the practice of artificial feeding was fraught with greatly increased hazards to the infants, these differences in the prevalence of breast and of artificial feeding in the several nationality groups were important in explaining differences in their mortality rates.

TABLE 94.—*Prevalence of artificial feeding, by color and nationality; of mother infants in eight cities*

Color and nationality of mother	Months lived to end of ninth		
	Total	Months of artificial feeding	
		Number	Per cent[1]
Total	192,212.5	47,842.0	24.9
White	180,397.5	45,516.5	25.2
Native	102,285.5	28,962.0	28.3
Foreign born	78,112.0	16,554.5	21.1
Italian	11,943.0	1,563.0	13.1
Jewish	10,688.0	1,207.0	11.3
French-Canadian	8,666.0	3,813.5	44.0
German	6,524.0	1,405.5	21.5
Polish	10,391.5	1,155.5	11.1
Portuguese	5,410.0	1,725.5	31.9
Other	24,471.5	5,677.5	23.2
Not reported	18.0	7.0	
Colored	11,815.0	2,325.5	19.7

[1] Not shown where base is less than 100.

With one or two exceptions variations in the prevalence of artificial feeding corresponded to variations in these rates. Among the noteworthy exceptions must be mentioned the practically equal prevalence of artificial and of breast feeding in the Jewish and Polish groups. In each of these groups the proportion of months lived from birth to the end of the ninth during which the infants were wholly breast fed was between three-fifths and two-thirds, and the proportion during which they were fed artificially was approximately one-ninth; yet the mortality rate for the Jewish, which was lower than that for any other race or nationality, was only one-third of the rate that prevailed in the Polish group. The mortality from gastric and intestinal diseases among Polish infants was six times as high as that among Jewish. Evidently, in spite of the similarity in prevalence of the several types of feeding, other factors—differences perhaps in the quality of artificial food, perhaps in social and economic environment, perhaps in physical vitality—must have been concerned in the causation of these marked variations in the rates.

An analysis of the mortality in the several nationality groups, as modified by allowance for variations in the prevalence of breast and artificial feeding, is presented in Table 95. The most favorable showing was made by the Jewish group, which maintained the same position after this allowance as before. The infants of native white mothers had the next most favorable rate; in this case, though the giving of artificial food was more prevalent than in any other group except the French-Canadian and the Portuguese, the mortality among both the breast fed and the artificially fed was low as compared with that among the breast-fed and the artificially-fed infants of most of the other nationalities. The German group ranked more favorably than the Italian, though their rates were practically identical when no allowance was made for differences in feeding; in other words, in the Italian group a less favorable mortality ex-

perience associated with other factors was offset by a greater practice of breast feeding. The relative rank of the infants of Polish, French-Canadian, and Portuguese mothers was altered when allowance was made for variations in the prevalence of breast and artificial feeding; the mortality in the French-Canadian group was changed to the lowest position, and that in the other two groups was approximately the same, the Polish being slightly higher. The markedly greater prevalence of breast feeding among the infants of Polish mothers tended to offset a mortality otherwise relatively very unfavorable, and, therefore, when no allowance was made for variations in the prevalence of breast and artificial feeding their rate appeared lower than that for either of the other two groups.

TABLE 95.—*Relative infant mortality, by color and nationality of mother, when influence of differences in type of feeding is eliminated; infants in eight cities*

Color and nationality of mother	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,555	2,555.0	100.0
White	2,330	2,404.3	96.9
Native	1,135	1,403.6	80.9
Foreign born	1,195	1,000.7	119.4
Italian	148	134.7	109.9
Jewish	66	118.8	55.6
French-Canadian	184	143.9	127.9
German	80	84.9	94.2
Polish	199	117.4	169.5
Portuguese	134	80.5	166.5
Other	384	320.3	119.9
Not reported		.2	
Colored	225	150.7	149.3

[1] Found by applying average mortality rate for each month of life and type of feeding to groups of infants classified by month of life, type of feeding, and color and nationality of mother; in case of infants not fed, by applying average mortality rate among infants not fed to infants in each color and nationality group.

For infants not fed the variations in the different nationality groups were less marked. Nevertheless in this group the rate of the infants of Jewish mothers was one-third below, and that of the infants of French-Canadian mothers was one-third above, the average. The babies of Portuguese and German mothers had relatively low rates, and the colored babies had the next to the highest rate. The most notable difference between rank as to mortality of all infants and rank as to mortality of infants not fed appeared in the case of the Portuguese group, which was transferred from the place next to the highest to that next to the lowest. The peculiar customs of infant feeding found among the Portuguese of the study were probably responsible for this change in position. (See General Table 74, p. 220.)

When the infants who died not fed were disregarded, the lowest mortality was found in the Jewish and the highest in the Polish group, the relative rank being the same as that shown in Table 95.[5]

[5] Further evidence upon the relative mortality among breast-fed, partly breast-fed, and artificially-fed infants in the several nationality groups is contained in General Table 74, p. 220.

It is clear that though differences in prevalence of breast and artificial feeding had a decided influence upon the rates for the several nationality groups, marked differences in mortality still remained to be accounted for by other factors.

HOUSING CONGESTION

The variations in the proportions of infants in families living one or more persons per room are shown in Table 96. The native white group had the smallest percentage living in such homes and the Polish the largest; 32.8 per cent of the babies in the former as compared with two and one-half times as large a percentage (82.5) of these in the latter were in families living one or more persons per room. Next to the native white in percentage living in such homes came the German with 50.9 per cent and the colored with 54 per cent. The Italian group had next to the highest percentage, 75.7.

When allowance was made in Table 97 for the variations in housing congestion, the rank of the several nationality groups as to infant mortality was not materially altered. The Jewish group still had a remarkably low and the Portuguese an excessively high infant mortality; the figure for the Polish babies seemed somewhat reduced.

TABLE 96.—*Proportion of infants in families living one or more persons per room, by color and nationality of mother; infants in seven cities who survived two weeks* [1]

Color and nationality of mother	Infants who survived two weeks—		
	Total	In families living one or more persons per room	
		Number	Per cent
Total	20,698	9,730	47.0
White	19,337	8,995	46.5
Native	10,896	3,578	32.8
Foreign born	8,441	5,417	64.2
Italian	1,303	987	75.7
Jewish	1,186	695	58.6
French-Canadian	1,026	606	59.1
German	707	360	50.9
Polish	1,119	923	82.5
Portuguese	652	461	70.7
Other	2,446	1,384	56.6
Not reported	2	1	
Colored	1,361	735	54.0

[1] Excluding a small number of infants in Baltimore who had not lived two weeks in dwelling to which data as to congestion related. For basic figures see General Table 75, p. 221.

TABLE 97.—*Relative mortality, by color and nationality of mother, when influence of housing congestion is eliminated; infants in seven cities who survived two weeks* [1]

Color and nationality of mother	Infant deaths		
	Actual	Expected [2]	Ratio of actual to expected (per cent)
Total	1,566	1,565.7	100.0
White	1,429	1,459.8	97.9
Native	660	734.0	89.9
Foreign born	769	725.8	106.0
Italian	84	119.2	70.5
Jewish	32	95.0	33.7
French-Canadian	136	82.4	165.0
German	53	54.3	97.6
Polish	138	119.5	115.5
Portuguese	117	58.6	199.7
Other	209	196.6	106.3
Not reported		.2	
Colored	137	105.9	129.4

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).
[2] Expected if in each group classified by nationality and persons per room, the average rate in the corresponding persons-per-room group had prevailed.

EMPLOYMENT OF MOTHER DURING PREGNANCY

Variations among the several nationalities in the prevalence of employment of mothers away from home during pregnancy are shown in Table 98. The proportions of infants born to mothers thus employed varied from 2.1 per cent in the Jewish to 41.5 per cent in the colored group. It is noteworthy that the figures were low for the Jewish, Italian, native white, and German groups, for which the mortality rates were below average, and high for the French-Canadian, Polish, Portuguese, and colored groups, for which the mortality rates were markedly above average. When allowance was made, however, for these variations, as in Table 99, the relative mortality in the several nationalities was not materially altered. The infants of the Jewish group showed the lowest mortality whether their mothers were employed or not employed, and those of the French-Canadian, Polish, Portuguese, and colored groups—both those whose mothers were employed and those whose mothers were not employed—showed high rates as compared with infants of mothers of other nationalities.

TABLE 98.—*Employment of mother away from home during pregnancy, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births—		
	Total	To mothers employed away from home during pregnancy	
		Number	Per cent
Total	22,967	3,084	13.4
White	21,510	2,480	11.5
Native	12,102	862	7.1
Foreign born	9,408	1,618	17.2
Italian	1,426	70	4.9
Jewish	1,233	26	2.1
French-Canadian	1,074	292	27.2
German	776	99	12.8
Polish	1,266	437	34.5
Portuguese	669	260	38.9
Other	2,962	434	14.7
Not reported	2		
Colored	1,457	604	41.5

TABLE 99.—*Relative mortality, by color and nationality of mother, when influence of employment of mother during pregnancy is eliminated; live births in eight cities*

Color and nationality of mother	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,555	2,555.0	100.0
White	2,330	2,359.1	98.8
Native	1,135	1,272.8	89.2
Foreign born	1,195	1,086.2	110.0
Italian	148	153.5	96.4
Jewish	66	128.2	51.5
French-Canadian	184	130.2	141.3
German	80	85.6	93.5
Polish	199	163.7	121.6
Portuguese	134	87.6	153.0
Other	384	337.3	113.9
Not reported		.2	
Colored	225	195.9	114.8

[1] Expected at average rates for infants of mothers in the corresponding employment-during-pregnancy groups, irrespective of nationality.

The question is important whether the variations in the proportions of mothers employed were due chiefly to differences in the economic status of the families or were also influenced by nationality traditions and customs as to the employment of mothers. According to Table 100, in which allowance was made for the variations in father's earnings in the several nationality groups, nationality traditions and customs exerted a marked influence in this respect. Of the Jewish and the Italian mothers very few went out to work; in the

former group only one-seventh, and in the latter one-fourth, as many mothers were employed away from home as were so employed on the average in the corresponding earnings-of-father groups. On the other hand, of the French-Canadian mothers nearly twice, and of the colored, the Portuguese, and the Polish over one and three-fourths times, as many were employed away from home as were so employed on the average in the corresponding earnings-of-father groups. So far, therefore, as the mother's employment was dependent upon the customs and traditions of the nationality group, these customs and traditions associated with nationality were responsible for the excessive mortality in certain groups and for the very favorable mortality in other groups associated with the greater or less prevalence of mother's employment.

TABLE 100.—*Prevalence of mother's employment away from home during pregnancy, by color and nationality of mother, when influence of economic need as a factor in mother's employment is eliminated;* [1] *live births in seven cities*

Color and nationality of mother	Live births to mothers employed away from home during pregnancy		
	Actual	Expected [2]	Ratio of actual to expected (per cent)
Total	3,071	3,070.7	100.0
White	2,467	2,738.5	90.1
Native	856	1,252.6	68.3
Foreign born	1,611	1,485.9	108.4
Italian	68	270.8	25.1
Jewish	26	181.9	14.3
French-Canadian	292	155.1	188.3
German	99	101.9	97.2
Polish	436	247.8	175.9
Portuguese	260	145.5	178.7
Other	430	382.8	112.3
Not reported		.1	
Colored	604	332.2	181.8

[1] As measured by the amount of father's earnings during year after birth of infant.
[2] Expected if the proportion of mothers employed away from home during pregnancy in each earnings-of-father group were applied to the live births classified by nationality of mother and earnings of father.

EMPLOYMENT OF MOTHER DURING FIRST YEAR OF INFANT'S LIFE

The variations in the proportion of mothers employed away from home during the first year of the infant's life, as shown in Table 101, appeared to follow closely those found in the prevalence of such employment during pregnancy. The lowest proportion (1.1 per cent) was found in the Jewish group and the highest (30.2 per cent) in the colored. Among the French-Canadian, Polish, and Portuguese mothers employment during this period was especially prevalent.

Since even in the group in which the employment of mothers away from home during the first year of the infant's life was most common—the colored—the proportion of mothers so employed was less than one-third and since the months lived by infants while their mothers were employed constituted a still smaller proportion

of the total months lived by all infants of the same group, the influence of these variations in the prevalence of mother's employment was not such as to change materially the relative rank in mortality rates of the several nationalities.

The more frequent employment away from the home of mothers in the Portuguese and French-Canadian groups may have been responsible in part for the greater prevalence of artificial feeding in these groups.[6] On the other hand, the unusually high proportion of Polish mothers who were so employed was associated with a record as to artificial feeding that was practically as favorable as that of the Jewish group.

In Table 102 the influence of nationality traditions and customs, as distinguished from that of low income, over the prevalence of employment of the mothers during the first year of their infants' lives is shown. Such employment appeared to be relatively rare among the Italian and Jewish mothers, but in the colored and the French-Canadian group twice as large a proportion of mothers were so employed as the average for all mothers whose husbands earned corresponding incomes.

TABLE 101.—*Prevalence of mother's employment away from home during first year of infant's life, by color and nationality of mother; infants in seven cities*

Color and nationality of mother	Live births—		
	Total	To mothers employed away from home during first year of infant's life	
		Number	Per cent
Total	21,536	1,730	8.0
White	20,085	1,292	6.4
Native	11,323	448	4.0
Foreign born	8,762	844	9.6
Italian	1,355	25	1.8
Jewish	1,223	13	1.1
French-Canadian	1,074	173	16.1
German	729	41	5.6
Polish	1,167	265	22.7
Portuguese	669	171	25.6
Other	2,543	156	6.1
Not reported	2		
Colored	1,451	438	30.2

[6] See pp. 142–143 for the influence of mother's employment away from home upon the prevalence of artificial feeding.

TABLE 102.—*Prevalence of mother's employment away from home during first year of infant's life, by color and nationality of mother, with influence of father's earnings as a factor in mother's employment eliminated; infants in seven cities*

Color and nationality of mother	Live births to mothers employed away from home during first year of infant's life		
	Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	1,730	1,729.3	100.0
White	1,292	1,510.0	85.6
Native	448	640.3	70.0
Foreign born	844	869.7	97.0
Italian	25	166.7	15.0
Jewish	13	107.2	12.1
French-Canadian	173	82.4	210.1
German	41	54.8	74.8
Polish	265	153.7	172.4
Portuguese	171	91.0	187.8
Other	156	213.8	73.0
Not reported		.1	
Colored	438	219.3	199.7

[1] Expected if the proportion of mothers employed away from home during the first year of the infant's life in each earnings-of-father group were applied to the live births classified by nationality and earnings.

EARNINGS OF FATHER

Among the most important differences that characterized the various nationalities were those in economic status as indicated by the father's earnings. This point is brought out clearly in Table 103, which gives for each nationality, as indicated by the native language of the mothers, the proportion of births that occurred in families in which the father earned less than $650. The proportion was highest in the colored group, in which 81.9 per cent of the births occurred in families in which the father earned less than $650. The lowest proportion (27.4 per cent) was found in the native white group. Marked differences appeared among the different foreign-born nationalities. Of these the German group had the lowest proportion, 41.2 per cent, of births in families in which the father earned less than $650, followed closely by the French-Canadian with 43.2 per cent and the Jewish with 44.5 per cent. The Italians, the Polish, and the Portuguese all had markedly high proportions in this earnings group—70.5, 78.3, and 78.5 per cent, respectively.

These differences in earnings ran parallel with and corresponded closely to differences in the infant mortality rates.

When allowances were made in Table 104 for variations in father's earnings among the nationality groups, the differences in the death rates appeared much reduced. The high mortality among the colored, for example, seemed to have been largely a reflection of their low economic status. Among the Polish, too, low father's earnings appeared to have accounted in large part for the excessive death rate. In the Portuguese and French-Canadian groups, on the other hand, a mortality considerably above the average appeared not to be accounted for by any differences in father's earnings. The low mortality among the infants of native white mothers seemed

to have been due in part to their comparatively superior economic position. When the effects of this superiority were eliminated, indeed, the Italian group appeared to have had lower rates than the native white, and the Jewish group showed the lowest rates of all.

TABLE 103.—*Proportion of births in families in which the father earned less than $650, by color and nationality of mother; live births in seven cities* [1]

Color and nationality of mother	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	21,536	9,133	42.4
White	20,085	7,944	39.6
Native	11,323	3,097	27.4
Foreign born	8,762	4,847	55.3
Italian	1,355	955	70.5
Jewish	1,223	544	44.5
French-Canadian	1,074	464	43.2
German	729	300	41.2
Polish	1,167	914	78.3
Portuguese	669	525	78.5
Other	2,543	1,145	45.0
Not reported	2		
Colored	1,451	1,189	81.9

[1] For basic figures see General Table 76, p. 221.

TABLE 104.—*Relative mortality, by color and nationality of mother, when influence of father's earnings is eliminated; live births in seven cities*

Color and nationality of mother	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	2,368	2,367.8	100.0
White	2,147	2,163.8	99.2
Native	1,063	1,115.6	95.3
Foreign born	1,084	1,048.2	103.4
Italian	135	176.3	76.6
Jewish	66	137.3	48.1
French-Canadian	184	118.8	154.9
German	74	79.8	92.7
Polish	185	156.6	118.1
Portuguese	134	91.2	146.9
Other	306	288.1	106.2
Colored	221	204.0	108.4

[1] Expected at average rates prevailing in each earnings-of-father group, irrespective of nationality of mother.

When allowances were made for variations in economic status, as measured by per capita income from father's earnings, among the several nationality groups, as in Table 105, almost the same results were obtained as when allowances were made for variations in father's

earnings regardless of the size of families. (See General Table 77, p. 222.) The reason for this, presumably, was that, on the average, differences in per capita income corresponded very closely with differences in father's earnings (p. 149). It may be noted, however, that in this table the relative positions of the Portuguese and French-Canadian groups were reversed, the mortality among the Portuguese appearing slightly higher.

TABLE 105.—*Relative mortality, by color and nationality of mother, when influence of differences in economic need [1] is eliminated; live births in seven cities*

Color and nationality of mother	Infant deaths		
	Actual	Expected [2]	Ratio of actual to expected (per cent)
Total	2,368	2,367.2	100.0
White	2,147	2,181.4	98.4
Native	1,063	1,147.2	92.7
Foreign born	1,084	1,034.2	104.8
Italian	135	168.6	80.1
Jewish	66	138.8	47.6
French-Canadian	184	127.2	144.7
German	74	82.2	90.0
Polish	185	145.2	127.4
Portuguese	134	86.2	155.5
Other	306	286.0	107.0
Colored	221	185.8	118.9

[1] As measured by per capita income from father's earnings.
[2] Expected if the rates prevailing in each per capita income (from father's earnings) group had prevailed in the corresponding group for each nationality.

EARNINGS OF FATHER AND TYPE OF FEEDING

The two factors, earnings of father and type of feeding, appeared to have exerted an important influence in producing the differences in the mortality rates for the several nationalities. Since, as will be shown later (p. 155), there was comparatively little correlation between father's earnings and the prevalence of artificial feeding, the combination of these two factors may have accounted for the differences in the rates for certain of the nationalities. Thus the mortality among the infants of Italian mothers, which was slightly below the average for the entire group, was influenced by two marked causes—an unusual prevalence of exclusively breast feeding and an unusually low economic status. When allowance was made for the former only, the rate appeared to be excessive, because of the influence of low economic status; when allowance was made for the latter only, the rate appeared to be unusually favorable, because of the influence of the favorable feeding. But when allowances were made for both factors together, as in Table 106, the rate for the Italian babies did not appear to vary in any marked degree from that for the native white group.

TABLE 106.—*Relative mortality, by color and nationality of mother, when influence of earnings of father and type of feeding is eliminated; infants in seven cities*

Color and nationality of mother	Infant deaths[1]		
	Actual	Expected[2]	Ratio of actual to expected (per cent)
Total	1,582	1,581.7	100.0
White	1,425	1,449.1	98.3
Native	675	762.9	88.5
Foreign born	750	686.2	109.3
Italian	84	96.8	86.8
Jewish	36	73.0	49.3
French-Canadian	134	105.0	127.6
German	51	52.6	97.0
Polish	128	85.6	149.5
Portuguese	106	75.1	141.1
Other	211	198.1	106.5
Colored	157	132.6	118.4

[1] During first nine months only. Excluding 514 not fed who died at once and 6 for whom type of feeding was not reported.

[2] Expected at average rates for each type of feeding in each month in each earnings group, irrespective of color and nationality.

SUMMARY

The analysis has shown clearly that color and nationality exerted a powerful influence over infant mortality, though whether that influence was due wholly to customs and traditions or partly to differences in innate vitality could not be determined. The marked variations in type of feeding among the various nationalities and the differences in average father's earnings, in proportions of mothers employed away from home, and in degrees of congestion in living quarters were responsible in large measure for the differences in the infant mortality rates. But even after each of these factors was allowed for, the babies of certain nationalities, notably the Jewish, were found to have experienced very low mortality, while those of other nationalities, notably the Polish and the Portuguese, had high rates. Though no attempt was made to eliminate all these factors together, in view of the tendency for certain of them to offset others, it is difficult to escape the conclusion that some factor associated with nationality apart from those the influence of which could be clearly traced was concerned with the differences in the mortality found in the various groups. As to whether there were differences in inborn vitality the present material affords no basis for a conclusion.

HOUSING CONGESTION

The influence of housing conditions upon infant mortality seems especially difficult to trace. In the present section discussion is limited to the influence of housing congestion as measured by the average number of persons per room.[1]

The group of infants on which this discussion is based does not include infants who died when under 2 weeks of age, nor infants born in Baltimore who had not lived at least two weeks in the dwelling occupied by the family, to which the data as to congestion related.

In Table 107 is shown the mortality among infants in families which lived in varying degrees of housing congestion. The rate was lowest (52.1) in the group in which the number of persons was less than the number of rooms and highest (135.7) in that in which the number of persons averaged two or more to a room.[2]

TABLE 107.—*Infant mortality rate, by cause of death and average number of persons per room; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infants surviving two weeks	Infant deaths	Infant mortality rates [2]					
			All causes	Gastric and intestinal diseases	Respiratory diseases	Early infancy	Epidemic and other communicable diseases	Other causes
Total	20,698	1,566	75.7	31.8	18.3	9.1	6.4	10.1
Less than 1	10,837	565	52.1	18.5	12.2	7.6	4.8	9.0
1, less than 2	8,558	812	94.9	42.1	23.6	10.0	7.6	11.6
2 and over	1,172	159	135.7	70.8	30.7	15.4	11.1	7.7
Not reported	131	30						

[1] Excluding a small number of infants who did not live 2 weeks in dwelling of residence (Baltimore).
[2] Not shown for "not reported" group because not significant.

CAUSES OF DEATH

Table 107 shows also the mortality rates for each of the principal groups of causes of death. The most marked variations appeared in the mortality from gastric and intestinal diseases; the rate from these diseases for infants in families which lived two or more persons to a room was over three and one-half times that for infants in families which lived less than one person to a room. But variations in the deaths from other causes were also found. From respiratory diseases the rate in families in which the number of persons averaged two or more per room was about two and one-half times that in families in which the number of persons was less than the number of rooms, and the rates from epidemic diseases and from causes peculiar to early infancy were over twice as high in the former as in the latter group.

[1] For a discussion of the influence of other aspects of housing and associated conditions in Baltimore see Infant Mortality—Results of a Field Study in Baltimore, Md., based on births in one year, by Anna Rochester, pp. 106-114 (U. S. Children's Bureau Publication No. 119, Washington, 1923).
[2] For rates in different months of the first year of life see General Table 78, p. 223.

TYPE OF FEEDING

A considerably larger proportion of the infants in families in which the number of persons was less than the number of rooms than of those in families which lived in more congested quarters were artificially fed. Thus during the third month 22.4 per cent (General Table 79, p. 224) of the babies in the group with less than one person per room received artificial food, as compared with only 10.3 per cent of those in the group in whose homes each room housed on an average three or more persons; the corresponding percentages in the sixth month were 31.8 and 19.3, and in the ninth 38.3 and 22.8. A greater prevalence of artificial feeding in the least as compared with the most congested homes therefore tended to obscure the differences in mortality which were associated with congestion. If a correction were made for this factor, the death rates of infants in the least congested homes, relatively to those of infants in the most congested homes, would appear even more favorable than they do in the tables.

COLOR AND NATIONALITY OF MOTHER

Table 108 shows that the group of infants who lived in the most congested homes included a much larger representation of races and nationalities which had high mortality rates than did that of infants who lived in the least congested homes. The proportion of babies whose mothers belonged to these races and nationalities averaged 31.9 per cent, but it was only 22.2 per cent in the group in homes with less than one person per room and as high as 72.7 per cent in the group in whose home each room housed on an average three or more persons.

When allowance was made in Table 109, however, for this overweighting of the more congested housing groups with an undue proportion of infants of nationalities which showed high death rates, the mortality among babies in homes with two or more persons per room still appeared to be twice as high as that among babies in homes with a smaller number of persons than of rooms. Though the correction for nationality reduced the high rate associated with the greatest housing congestion, there remained a decided excess mortality that appeared to be associated with overcrowding.

TABLE 108.—*Proportion of births to mothers of nationalities with high infant mortality rates, by average number of persons per room; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infants who survived two weeks [1]—		
	Total	Born to mothers of nationalities with high infant mortality rates [2]	
		Number	Per cent
Total	20,698	6,604	31.9
Less than 1	10,837	2,405	22.2
1, less than 2	8,558	3,448	40.3
2, less than 3	1,040	565	54.3
3 and over	132	96	72.7
Not reported	131	90	68.7

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore). For basic figures see General Table 75, p. 221.
[2] Includes French-Canadian, Polish, Portuguese, "other foreign born," and colored.

TABLE 109.—*Relative infant mortality, by average number of persons per room, when influence of nationality of mother is eliminated; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infant deaths			Ratio of rate in specified group to average (per cent)[4]
	Actual	Expected [2]	Ratio of actual to expected (per cent)[3]	
Total	1,566	1,565.9	100.0	100.0
Less than 1	565	756.9	74.6	68.8
1, less than 2	812	688.4	118.0	125.4
2 and over	159	106.8	148.9	179.3
Not reported	30	13.8		

[1] Excluding a small number of infants who lived less than two weeks in dwelling of residence (Baltimore).
[2] Expected at average rates prevailing in each nationality group.
[3] Not shown for "not reported" group because not significant.
[4] Computed from rates in Table 107.

EARNINGS OF FATHER

A marked correlation was found between the number of persons per room and the father's earnings; the proportion of infants whose fathers earned less than $650, according to Table 110, was only 28.1 per cent in families in which the number of persons was less than the number of rooms but was 77.3 per cent in those which lived three or more persons per room. The question arises whether the high mortality found to characterize the babies who lived in crowded quarters was due to housing congestion and its attendant evils or to other factors associated with low earnings.

After allowance was made in Table 111 for this correlation with father's earnings, however, differences in mortality between the congestion groups remained, though they were less marked than before. Evidently, therefore, housing congestion exercised an influence upon infant mortality apart from any correlation with low father's earnings.

TABLE 110.—*Proportion of births in families in which father earned less than $650, by average number of persons per room; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infants who survived two weeks [1]—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	20,698	8,752	42.3
Less than 1	10,837	3,046	28.1
1, less than 2	8,558	4,711	55.0
2, less than 3	1,040	792	76.2
3 and over	132	102	77.3
Not reported	131	101	77.1

[1] Excluding a small number of infants who lived less than two weeks in dwelling of residence (Baltimore).
For basic figures see General Table 80, p. 224.

TABLE 111.—*Relative infant mortality, by average number of persons per room, when influence of father's earnings is eliminated; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infant deaths			Ratio of rate in specified group to average (per cent) [4]
	Actual	Expected [2]	Ratio of actual to expected (per cent) [3]	
Total	1,566	1,566.2	100.0	100.0
Less than 1	565	708.6	79.7	68.8
1, less than 2	812	728.0	111.5	125.4
2 and over	159	116.6	136.4	179.3
Not reported	30	13.0		

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).
[2] Expected at average rates prevailing in corresponding father's earnings groups.
[3] Not shown for "not reported" group because not significant.
[4] Computed from rates in Table 107.

To ascertain whether the excess mortality associated with the more crowded dwellings was due to the greater economic pressure in the larger families Tables 112 and 113 were compiled. The former shows that the babies in the more crowded dwellings included a very disproportionate number of those in families with low per capita income from father's earnings, and the latter shows the influence upon mortality associated with housing congestion, when the influence of variations in economic pressure is eliminated. The analysis shows that after allowance was made for variations in per capita income from father's earnings the effect of housing congestion was still marked and about the same as after allowance was made for variations in father's earnings. In other words the latter was practically equivalent to the former.

TABLE 112.—*Proportion of births in families with average per capita income from father's earnings of less than $200, by average number of persons per room; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infants who survived two weeks [1]—		
	Total	In families with per capita income of less than $200 [2]	
		Number	Per cent
Total	20,698	9,992	48.3
Less than 1	10,837	2,783	25.7
1, less than 2	8,558	6,106	71.3
2, less than 3	1,040	916	88.1
3 and over	132	114	86.4
Not reported	131	73	55.7

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore) and infants whose fathers earned $1,250 or more. For basic figures see General Table 81, p. 224.
[2] From father's earnings. Father's earnings of $1,250 and over not classified according to per capita income from father's earnings.

TABLE 113.—*Relative mortality, by average number of persons per room, when influence of economic pressure as measured by the average per capita income from father's earnings is eliminated; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infant deaths		
	Actual	Expected [2]	Ratio of actual to expected (per cent) [3]
Total	1,566	1,566.1	100.0
Less than 1	565	679.9	83.1
1, less than 2	812	753.5	107.8
2 and over	159	122.0	130.3
Not reported	30	10.7	

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).
[2] Expected at average rates in each per capita income group, irrespective of the number of persons per room.
[3] Not shown for "not reported" group because not significant.

EARNINGS OF FATHER AND NATIONALITY OF MOTHER

The high correlation found between housing congestion and both earnings of father and nationality of mother suggests that the combined influences of these two factors may have accounted for a considerable part of the effect upon mortality associated with housing congestion. But Table 114, in which both factors were eliminated, shows that, apart from both, housing congestion exerted a marked influence upon the death rates.

TABLE 114.—*Relative mortality, by average number of persons per room, when influence of earnings of father and color and nativity of mother is eliminated; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infant deaths		
	Actual	Expected [2]	Ratio of actual to expected (per cent) [3]
Total	1,566	1,566.0	100.0
Less than 1	565	697.1	81.1
1, less than 2	812	734.8	110.5
2, less than 3	139	107.1	129.8
3 and over	20	13.7	146.0
Not reported	30	13.3	

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).
[2] Expected at average rates in each group classified by earnings of father and color and nativity of mother, irrespective of average number of persons per room.
[3] Not shown for "not reported" group because not significant.

SUMMARY

Housing congestion was found to have exerted an influence upon infant death rates, the mortality among infants in homes in which the number of persons averaged two or more per room being two and one-half times as high as that among infants in whose homes the number of persons was less than the number of rooms. When allow-

ances were made for the correlation between housing congestion on the one hand and earnings of father and nationality of mother on the other, this apparent excess mortality among babies in the most congested dwellings was reduced to about twice that among babies in the least congested homes.

The analysis by cause of death showed differences as between the groups classified according to the degree of crowding within the dwelling in the mortality from gastric and intestinal, from respiratory, and from epidemic and other communicable diseases. These differences may be attributed to the association of congested living quarters with greater difficulty of keeping away infections of various kinds from the babies, and to the association of such quarters with lack of cleanliness in connection with the baby's food and with lack of fresh air.

ECONOMIC FACTORS[1]

The economic factors in infant mortality treated in the present analysis are the mother's employment during the period of pregnancy and during the first year of the baby's life, the father's earnings, and the family's per capita income from the father's earnings. Each of these factors may exert an indirect influence through its effect upon the mother's health or upon the care given the infant.

It should be emphasized that in every case these various economic conditions were directly related to the particular infant whose chances of life might be affected. Thus the data as to the father's earnings related to the amount earned during the year immediately following the baby's birth—that is, during the period when his earnings would be closely associated with the infant's chances of life; and the information as to the mother's employment related to work during the period of pregnancy preceding and, if the baby was alive at the time work was begun or resumed, to work during the year following the infant's birth.

EMPLOYMENT OF MOTHER DURING PREGNANCY

The information obtained concerning the mother's employment during the period of pregnancy included statements as to whether she had worked at home or away from home, her specific occupation, and the interval between cessation of work and confinement. As gainfully employed were classed all mothers who had worked for wages or for salaries, had kept boarders or lodgers, had done factory work at home for pay, or had helped in their husbands' business. So far as the severity of the labor performed either by the mothers who had been gainfully employed at home or away from home or by those who had not been employed is concerned, no information was obtained except such as might be inferred from the nature of their occupations. Even the mothers reported as not employed may have done housework involving long hours and heavy labor. The comparison, therefore, is not between women who had worked and other women who had enjoyed leisure but between women who had engaged in a regular occupation, often with housework in addition, and other women who had done only housework.

Nearly one-third of the mothers of live-born infants had engaged in gainful labor either at home or away from home during the period of pregnancy. Slightly over half of these had been employed at home and the rest—over one-eighth of the entire number—away from home.

The mortality rate for the infants of mothers who had been employed away from home during pregnancy, as shown in Table 115, was 176.1—1.8 times the rate (98) for those whose mothers had not been employed. For the infants of mothers employed at home, on the other hand, it was 114.6—or only one-sixth higher than the rate for those whose mothers had not been employed.

[1] A summary of this chapter was published in the Quarterly Publications of the American Statistical Association, Vol. XIX, pp. 137–155 (June, 1924).

TABLE 115.—*Infant mortality rates, by cause of death and employment of mother during pregnancy; live births in eight cities*

Employment of mother during pregnancy	Live births	Infant deaths from specified causes					
		All causes		Gastric and intestinal diseases		Respiratory diseases	
		Number	Infant mortality rates [1]	Number	Infant mortality rates [1]	Number	Infant mortality rates [1]
Total	22,967	2,555	111.2	743	32.4	450	19.6
Employed away from home	3,084	543	176.1	191	61.9	103	33.4
Employed at home	3,788	434	114.6	138	36.4	95	25.1
Not employed	16,089	1,576	98.0	412	25.6	252	15.7
Not reported	6	2		2			

Employment of mother during pregnancy	Infant deaths from specified causes					
	Early infancy		Epidemic and other communicable diseases		Other causes	
	Number	Infant mortality rates [1]	Number	Infant mortality rates [1]	Number	Infant mortality rates [1]
Total	830	36.1	162	7.1	370	16.1
Employed away from home	155	50.3	34	11.0	60	19.5
Employed at home	103	27.2	33	8.7	65	17.2
Not employed	572	35.6	95	5.9	245	15.2

[1] Not shown for "not reported" group because not significant.

Causes of death of infant.

The variation, according to mother's employment during pregnancy, of mortality from gastric and intestinal diseases, from respiratory diseases, and from epidemic diseases, as Table 115 shows, was similar to that of the mortality from all causes; the rates were lowest for the infants whose mothers had not been employed and highest for those whose mothers had been employed away from home. The rate from causes peculiar to early infancy, on the other hand, was lowest not for the babies of the "not employed" but for those of the "employed at home" group of mothers; but it was highest for the babies of the "employed away from home" group.

Neonatal mortality.

This tendency for the mortality to be excessive among infants of mothers who had been employed away from home during pregnancy was found also in the neonatal rates. Among the babies of the "employed at home" group, on the other hand, the neonatal mortality, like that from causes peculiar to early infancy, was lower even than that for the babies of the "not employed" group.[1a] The unusually low figures (shown in Table 116) for the group of mothers who had been employed at home may have been due in part to the fact that the amount and character of the work done by these mothers was similar to that done in performing their ordinary household and

[1a] For rates in later months see General Table 82, p. 225.

family duties by mothers who were not gainfully employed, and in part, perhaps, to a tendency on the part of the mothers who were in poor physical condition not to engage in gainful labor. The "not employed" group of mothers may actually have been somewhat unfavorably weighted by the inclusion of certain mothers who would have been in one of the other groups if they had enjoyed normal health. That the infants whose mothers had been employed away from home during pregnancy showed higher death rates than those whose mothers had not been so employed or had not been employed at all was, in any case, significant evidence of the influence of this type of employment.

Interval between cessation of work and confinement.

Of the mothers who had been gainfully employed away from home a small proportion (13.3 per cent) had been thus employed until within one month of confinement, more than half of these reporting working practically to the date of the baby's birth. According to Table 116, a markedly higher mortality was found among the infants of these mothers than among those whose mothers had stopped work one month or more before confinement. In the comparatively small group of babies born to mothers who reported no interval between cessation of work away from home and the birth, the mortality rate was 244.2, as compared with 187.5 for babies of mothers who had intervals of rest of less than one month, and with 169.3 for those of mothers who had intervals of rest of one month or more.

TABLE 116.—*Infant mortality and neonatal mortality rates, by place of employment of mother during pregnancy and interval between cessation of work and confinement; live births in seven cities*

Employment of mother during pregnancy and interval between cessation of work and confinement	Live births	Infant deaths			
		Total	Infant mortality rates [1]	Under 1 month	
				Number	Neonatal mortality rates [1]
Total	21,536	2,368	110.0	954	44.3
Mother employed away from home	3,071	540	175.8	193	62.8
No interval	217	53	244.2	24	110.6
Interval under 1 month	192	36	187.5	16	83.3
Interval 1 month and over	2,634	446	169.3	153	58.1
Interval not reported	28	5			
Mother employed at home	3,535	386	109.2	123	34.8
No interval	2,683	278	103.6	84	31.3
Interval under 1 month	214	31	144.9	12	56.1
Interval 1 month and over	598	70	117.1	25	41.8
Interval not reported	40	7		2	
Mother not employed	14,924	1,440	96.5	638	42.7
Employment of mother not reported	6	2			

[1] Not shown where base is less than 100.

The neonatal mortality rate was likewise much higher for infants of mothers employed away from home who reported little or no interval of rest before confinement than for those of mothers who reported

intervals of at least one month; it was 110.6 for those of the "no interval" and 83.3 for those of the "less than one month" group, as compared with 58.1 for the "one month and over" group. These figures should also be contrasted with the neonatal mortality rate of 42.7 for babies whose mothers had not been gainfully employed.

Among the infants of mothers who had worked at home during pregnancy a somewhat different situation was found. In this group the mortality rate for babies whose mothers had less than one month of rest before confinement was 144.9, as compared with a rate of 117.1 for babies whose mothers had rest intervals of one month or more. But the rate for infants of mothers who reported no interval of rest was lower than that for either of these groups. The neonatal rate, likewise, was lowest for the group of infants whose mothers reported no interval of rest before confinement—31.3 as compared with 56.1 for the infants of mothers who had less than one month's rest and 41.8 for those of mothers who had rest periods of one month or more. A plausible explanation is that the work of the mothers who had no rest before the birth of the child was not usually of an arduous type and did not involve heavy physical labor.

Prematurity.

As Table 117 shows, the proportion of premature births to mothers who had been employed away from home was greater than for either of the other groups—6.1 per cent as compared with 5.2 per cent for the group of mothers who had not been employed and with 3.5 per cent for the group employed at home. The relatively high proportion of premature births to mothers who had not been employed may have been due in part, as has already been suggested, to the inclusion in this group of an unduly large proportion of mothers who were not in good health.

Though the greater prevalence of premature births to mothers who had been employed away from home tended to explain in part the higher mortality among these infants, it failed to account fully for their higher rate from all causes or even for their higher rate from causes peculiar to early infancy. Greater mortality was found among the infants born at term to mothers who had worked away from home than among other full-term infants.

TABLE 117.—*Proportion of premature births, by employment of mother during pregnancy; live births in eight cities*

Employment of mother during pregnancy	Live births		
	Total	Premature births	
		Number	Per cent
Total	22,967	1,158	5.0
Employed away from home	3,084	187	6.1
Employed at home	3,788	131	3.5
Not employed	16,089	840	5.2
Not reported	6		

Type of feeding.

A slightly larger proportion of the infants of mothers who had been employed away from home during pregnancy were artificially fed

than of the infants whose mothers had worked at home or of those whose mothers had not worked during this period. In the third month of life, for example, the percentages artificially fed were 16.7 for infants of mothers who had been employed at home, 20.9 for those of mothers who had not been employed, and 22.2 for those of mothers who had been employed away from home. The corresponding percentages for the ninth month of life were 31, 34.8, and 40.3, respectively.[2]

The greater proportion artificially fed in the group of infants whose mothers had been employed away from home accounted for a part of the higher mortality among them, especially from those diseases most closely associated with type of feeding.

The markedly lesser prevalence of artificial feeding among the infants of mothers who had been employed at home during pregnancy also tended to account for the somewhat lower mortality among these infants.

Color and nationality of mother.

Nearly three times as large a proportion of the infants whose mothers had been employed away from home during pregnancy as of those whose mothers had not been employed, according to Table 118, were of race or nationality groups which had higher than average mortality rates—65.7 per cent as compared with only 23 per cent.

The excessive mortality found associated with the mother's employment away from home, therefore, was accounted for in part by the correlation of such employment with nationality groups having high rates. Table 119 shows, however, that this correlation was responsible for only a relatively small part of the high mortality among infants of mothers who had been employed away from home during pregnancy. In each nationality group a markedly greater mortality was found—though not so great as that found when no allowance was made for influence of race and nationality of mother—among infants of mothers who had been employed away from home than among those of either of the other two groups of mothers.

TABLE 118.—*Proportion of births to mothers of nationalities with high infant mortality rates, by employment of mother during pregnancy; live births in eight cities*

Employment of mother during pregnancy	Live births—		
	Total	To mothers of nationalities with high infant mortality rates [a]	
		Number	Per cent [b]
Total	22,967	7,428	32.3
Employed away from home	3,084	2,027	65.7
Employed at home	3,788	1,702	44.9
Not employed	16,089	3,697	23.0
Employment not reported	6	2	----------

[a] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored. Compare with Table 99, p. 118.

[b] Not shown where base is less than 100.

[2] See General Table 84, p. 225.

TABLE 119.—*Relative infant mortality, by employment of mother during pregnancy, when influence of color and nationality of mother is eliminated; live births in eight cities*

Employment of mother during pregnancy	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent) [2]
Total	2,555	2,555.3	100.0
Employed away from home	543	420.1	129.3
Employed at home	434	439.8	98.7
Not employed	1,576	1,694.6	93.0
Not reported	2	.8	

[1] Expected if the average infant mortality rate for each color and nationality group applied to all live births of that nationality, irrespective of the employment of the mother during pregnancy.
[2] Not shown for "not reported" group because not significant.

Earnings of father.

According to Table 120, a much larger proportion of the infants of mothers who had been employed away from home (70.6 per cent) than of those of mothers who had been employed at home (53.4 per cent) or of those of mothers who had not been employed (34 per cent) were born in families in which during the year following the baby's birth the father earned less than $650. A marked correlation existed, therefore, between father's earnings and the prevalence of mother's employment. Since the death rate was high for infants whose fathers' earnings were low, the question is pertinent whether the excessive mortality among babies whose mothers had been employed away from home was due to the disproportionate weighting of this group with babies whose fathers' earnings were low, or whether, even after full weight was given to the effect of this association, the employment of the mothers still seemed to have exerted an influence over the rate.

When allowance was made in Table 121 for the correlation between low earnings of father and employment of mother, the infants of mothers who had been employed away from home during pregnancy were found to have had a mortality markedly higher than that among the infants either of mothers who had been employed at home or of mothers who had not been employed. The rates for the two last-mentioned groups appeared to be almost equal when allowance was made for the correlation between father's earnings and mother's employment.

TABLE 120.—*Proportion of births in families in which father earned less than $650, by employment of mother during pregnancy; live births in seven cities* [1]

Employment of mother during pregnancy	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	21,536	9,133	42.4
Employed away from home	3,071	2,167	70.6
Employed at home	3,535	1,889	53.4
Not employed [2]	14,930	5,077	34.0

[1] Compare with Table 150. [2] Including births to mothers for whom employment was not reported.

TABLE 121.—*Relative mortality, by employment of mother during pregnancy, when influence of father's earnings is eliminated; live births in seven cities*

Employment of mother during pregnancy	Infant deaths		
	Actual	Expected [1]	Ratio of actual to expected (per cent) [2]
Total	2,368	2,368.2	100.0
Employed away from home	540	404.0	133.7
Employed at home	386	420.1	91.9
Not employed	1,440	1,543.2	93.3
Employment not reported	2	0.9	

[1] Expected if average infant mortality rate for each father's earnings group applied to all live births in the group, irrespective of the employment of mother during pregnancy.
[2] Not shown for "not reported" group because not significant.

When allowance was made for both earnings of father and color and nativity of mother jointly, as in Table 122, the mortality among infants whose mothers were employed during pregnancy still appeared about 40 per cent higher than that among infants whose mothers were not gainfully employed.

TABLE 122.—*Relative mortality, by employment of mother during pregnancy, when influence of earnings of father and color and nativity of mother is eliminated; live births in seven cities*

Employment of mother during pregnancy	Infant deaths		
	Actual	Expected [1]	Ratio of of actual to expected (per cent)
Total	2,368	2,368.0	100.0
Employed away from home	540	409.7	131.8
Employed at home	386	425.6	90.7
Not employed	1,440	1,532.0	94.0
Not reported	2	.8	

[1] Expected at average rates for infants of the same earnings-of-father and color-and-nativity-of-mother groups, irrespective of employment of mother during pregnancy.

Employment of mother during infant's life.

The mortality rates from causes peculiar to early infancy and the neonatal rates can not have been influenced—or can have been influenced only very slightly—by the mother's employment during the infant's first year. On the other hand, since the mother's employment during this year (as will be shown in the next section) was likely to be associated with artificial feeding, the mortality from gastric and intestinal diseases may have been influenced decidedly by such employment.

Of the mothers who had been employed during pregnancy 73 per cent were employed also during some part of the infant's first year of life. Of those who had been employed away from home during pregnancy 41.7 per cent were employed away from home and 13.7

per cent at home during the later period; and of those who had been employed at home during pregnancy 2.5 per cent were later employed away from and 85 per cent at home. On the other hand, of the mothers who had not been employed during the period of pregnancy only 6.6 per cent were employed either at home or away from home during the infant's first year of life. (See General Table 86, p. 226.)

TABLE 123.—*Employment of mother away from home during first year of infant's life, by her employment during pregnancy; live births in eight cities* [1]

Employment of mother during pregnancy	Live births—		
	Total	To mothers employed away from home during first year of infant's life	
		Number	Per cent
Total	22,967	1,742	7.6
Employed away from home	3,084	1,285	41.7
Employed at home	3,788	96	2.5
Not employed [2]	16,095	361	2.2

[1] For basic figures see General Table 86, p. 226.
[2] Including cases in which mother's employment was not reported.

It is evident, therefore, that the mother's employment during the period of pregnancy was closely associated with her employment during the first year of the infant's life and that any conclusion as to the influence of the former over the prevalence of gastric and intestinal diseases must take into account the marked influence of the latter over the prevalence of artificial feeding. This point is discussed in the following section (p. 142).

Causes of employment of mother during pregnancy.

The causes of the employment of mothers during pregnancy were doubtless similar to those of the employment of married women in general and were primarily economic. The influence of the economic factor was shown very clearly in the much greater proportions of mothers found to have been employed in the lower as compared with the higher earnings-of-father groups; this subject is discussed in detail in the section dealing with father's earnings (pp. 158–160). On the other hand, even in cases in which the father's earnings were the same, marked variations were found between the different race and nationality groups in the proportion of mothers who worked away from home during pregnancy. Evidently under the same conditions of economic pressure the traditions and customs prevailing in each such group had a powerful influence in determining whether or not the mothers should go to work (pp. 118–119).

Summary.

Nearly one-third of the mothers had been gainfully employed during pregnancy, 55 per cent of them at home and 45 per cent away from home.

The gainful employment of the mother at home was found to have been associated with slightly higher infant death rates from all causes

and from gastric and intestinal and respiratory diseases, but with a slightly lower neonatal mortality, with a somewhat lower rate from causes peculiar to early infancy, and with a lower percentage of premature births than were found for babies of mothers who had not been employed at all. The higher mortality in early infancy among babies whose mothers had not been employed, as compared with that among infants of mothers who had been employed at home during pregnancy, may have been due in part to the fact that the former group included mothers who, except for ill-health, would have been at work. Furthermore, the fact that mothers were not gainfully employed did not mean that they were at leisure; in most cases, doubtless, such mothers were occupied with housework, sewing, and the care of children—work probably not very different from that performed by the mothers employed at home. The evidence does not indicate that the mother's gainful employment at home during pregnancy was especially harmful to the infant.

Employment of the mother away from home during pregnancy, on the other hand, was associated with a high mortality from all causes, from gastric and intestinal and respiratory diseases, and from causes peculiar to early infancy, with a high neonatal mortality, and with a high percentage of premature births. The influence of such employment was found to have been greater the shorter the interval of rest before confinement. About one-eighth of the total number of births were to mothers who were employed away from home during pregnancy. Such employment exerted an influence over infant mortality irrespective of any correlation with nationality of mother or with father's earnings, and its influence over the proportion of premature births and over mortality in early infancy was evidently independent of any correlation with the mother's employment during the first year of the infant's life.

EMPLOYMENT OF MOTHER DURING FIRST YEAR OF INFANT'S LIFE

According to Table 124, slightly over one-fourth of all the births were to mothers who were gainfully employed either at home or away from home during some part of the infant's first year of life. Of these employed mothers more than seven-tenths worked at home; less than one-third—or about one-twelfth of the total number in the eight cities—worked away from home.

Since in many cases the mothers did not go to work until their babies were nearly a year old, furthermore, this proportion (one-twelfth) tends to overstate the importance of the employment of mothers away from home as an influence upon the mortality rate. Of the months lived by all the infants from birth up to the end of the first year only 4.5 per cent (one-twenty-second) were lived by babies after their mothers had begun or resumed work away from home.

Only one-fifth of the mothers who were employed away from home during their infants' first year of life, according to Table 125, began such work before the end of the second month; but over half of them had begun by the end of the fifth month. On the other hand, of the mothers who were employed at home during this period over half (56 per cent) began within one month, and by the end of the third month over three-fourths were at work.

TABLE 124.—*Employment of mother during first year of infant's life; infants in eight cities*

Employment of mother during first year of infant's life	Live births		Months lived from time mother went to work to end of first year	
	Number	Per cent distribution	Number	Per cent distribution
Total	22,967	100.0	253,853.00	100.0
Employed away from home	1,742	7.6	[1] 11,377.75	4.5
Employed at home	4,337	18.9	[2] 39,432.50	15.5
Not employed	16,887	73.5	[3] 203,042.75	80.0
Not reported [4]	1			

[1] Excluding months lived by 3 infants whose ages at the time their mothers went to work were not reported.
[2] Excluding months lived by 59 infants whose ages at the time their mothers went to work were not reported.
[3] Including cases in which mother's employment was not reported.
[4] Place of employment not reported.

TABLE 125.—*Age of infant when mother went to work, by place of mother's employment; infants in eight cities whose mothers went to work during first year of infant's life*

Month of infant's life in which mother resumed work	Infants whose mothers were employed during first year of infant's life—			Month of infant's life in which mother resumed work	Infants whose mothers were employed during first year of infant's life—		
	Total	Away from home	At home		Total	Away from home	At home
Total	[1] 6,080	1,742	4,337	6 months, under 7	276	144	132
				7 months, under 8	200	111	89
Under 1 month	2,533	105	2,428	8 months, under 9	215	138	77
1 month, under 2	872	243	629	9 months, under 10	189	99	90
2 months, under 3	511	233	278	10 months, under 11	156	84	72
3 months, under 4	444	242	202	11 months, under 12	76	46	30
4 months, under 5	287	143	144	Not reported	[1] 63	3	59
5 months, under 6	258	151	107				

[1] Including one case for which neither the place of the mother's employment nor the infant's age when she began work was reported.

Obviously any true comparison of the mortality among infants whose mothers were employed with that among infants whose mothers were not employed must take into account the different ages of the infants at the time when their mothers commenced work. In this process account must be taken not only of the varying probabilities of dying at the different ages but also of the varying lengths of time during which the babies were exposed to the risk of death. Thus an infant whose mother went to work at the beginning of the twelfth month had a smaller probability of dying within one month than an infant whose mother went to work at the beginning of the third month; but, even apart from differences in the mortality rates at these ages, the baby whose mother went to work at the beginning of the twelfth month, other things being equal, had a risk of dying before his first birthday only one-tenth as great as that of the baby whose mother went to work at the beginning of the third month, since the latter had 10 times as long to live before reaching his first birthday.

The mortality among infants whose mothers were employed during the infants' first year of life, as compared with that among infants of mothers who were not employed, can best be presented, therefore, in the form of a comparison between the deaths that actually occurred in the former group and those that would have occurred if the mortality rates of babies of the same ages in the latter group had prevailed in it. Such comparisons of actual and expected deaths are presented in the following tables.

Causes of death.

According to Table 126, among the infants whose mothers were employed away from home during the infants' first year of life 168 deaths occurred, or nearly two and one-half times as many as the number (67.8) that would have been expected at average rates for the corresponding ages. This excess mortality was found especially in deaths from gastric and intestinal diseases, which were over three times as numerous as they would have been if average rates had prevailed. The mortality from respiratory diseases was twice as high as the average.

No significant differences from the average rates were found, on the other hand, for the infants whose mothers were employed at home. In other words, the extra hazard found associated with the mother's employment away from home does not appear to have extended to these babies whose mothers worked at home.

TABLE 126.—*Mortality among infants of mothers employed during first year of infant's life as compared with average mortality among all infants, by cause of death and place of mother's employment; infants in eight cities*

Cause of death	Deaths of infants whose mothers during first year of infant's life were employed—					
	Away from home			At home		
	Actual	Expected [1]	Ratio of actual to expected	Actual	Expected [1]	Ratio of actual to expected
All causes	168	67.8	2.5	282	262.6	1.1
Gastric and intestinal diseases	101	31.1	3.2	122	114.8	1.1
Respiratory diseases	39	17.8	2.2	78	66.1	1.2
Epidemic and other communicable diseases	7	6.7	1.0	27	24.2	1.1
Other	21	12.2	1.7	55	57.5	1.0

[1] Expected at average mortality rates from specified cause in each month of life. In the first month the rates for the second two weeks were used.

Interval between confinement and resumption of work.

According to Table 127, the excess mortality associated with the mother's work away from home was greater the earlier such work was begun or resumed after the birth. Thus the babies whose mothers were employed away from home beginning when the baby was less than 2 months old had a mortality three times the average, and those whose mothers began such work when the baby was between 2 and 9 months old had a mortality about twice the average. On the other hand, the babies whose mothers were employed at home appeared to have been subject to average mortality rates even in cases in which

the mother commenced work when the baby was less than a month old. Presumably in these cases the work at which the mother was employed was not arduous and did not lessen the amount of care which she could give her infant.

TABLE 127.—*Mortality among infants whose mothers were employed as compared with average mortality rates; infants in eight cities*

Month of infant's life in which mother went to work	Deaths of infants whose mothers during first year of infant's life were employed—					
	Away from home			At home		
	Actual	Expected[1]	Ratio of actual to expected	Actual	Expected[1]	Ratio of actual to expected
Total	168	70.5	2.4	282	263.2	1.1
First	25	7.8	3.2	216	178.1	1.2
Second	46	15.9	2.9	31	41.0	.8
Third	23	13.3	1.7	16	15.8	1.0
Fourth	31	12.0	2.6	2	10.0	.2
Fifth	15	6.0	2.5	3	6.1	.5
Sixth	12	5.2	2.3	8	3.7	2.2
Seventh and eighth	12	6.4	1.9	1	5.7	0.2
Ninth to twelfth	4	3.9	1.0	5	2.8	1.8

[1] Expected at average mortality among all infants. The figures are the sum of two separate calculations: To the deaths expected at average mortality for the remainder of the first year among the infants surviving at the beginning of the month immediately following that in which the mother went to work were added the deaths expected at average monthly death rates from the time the mother went to work to the beginning of the next month; it was assumed for the purpose of calculation that no mothers commenced work within two weeks of the birth. The slight difference in the number of expected deaths in Tables 126 and 127 is explained by the difference in the method of calculation.

Type of feeding.

Of the months lived prior to the end of the ninth but after the mothers' employment had begun, by infants of mothers who were employed away from home during any part of this period, as Table 128 shows, a much larger proportion were months of artificial feeding than of those lived by infants of mothers who were not employed—51.4 per cent as compared with 24 per cent. The percentage of months during which artificial food was given was a trifle lower, however, for the babies whose mothers were employed at home than for those whose mothers were not employed at all. To a slight extent the prevalence of artificial feeding among the infants of mothers who were employed away from home may have been due to the tendency toward an increasing resort to such feeding in the later months of life; but both in the early and in the later months artificial food was markedly more often given to the babies whose mothers were employed away from home than to other babies.[3]

When allowance was made in Table 129 for the greater prevalence of artificial feeding among the infants of mothers who worked away from home, it appeared that the excess mortality among them was considerably reduced though not entirely eliminated. In other words, part of the high mortality associated with the mother's employment away from home was due to the associated tendency toward a greater recourse to artificial food.

[3] See also General Tables 87, 88, and 89, pp. 227, 228.

TABLE 128.—*Prevalence of artificial feeding, by employment of mother; infants in eight cities*

Employment of mother	Months lived from birth to end of ninth		
	Total	Months of artificial feeding	
		Number	Per cent
Total	192,212.50	47,842.00	24.9
Employed away from home	6,891.00	3,540.00	51.4
Employed at home	27,585.25	6,387.75	23.2
Not employed [1]	157,736.25	37,914.25	24.0

[1] Including cases in which mother's employment was not reported.

TABLE 129.—*Mortality among infants whose mothers were employed during first year of infant's life as compared with that among infants whose mothers were not employed, when influence of difference in type of feeding is eliminated; infants in eight cities*

Type of feeding	Deaths of infants whose mothers during first year of infant's life were employed—					
	Away from home			At home		
	Actual	Expected [1]	Ratio of actual to expected	Actual	Expected [1]	Ratio of actual to expected
Total	168	85.5	2.0	282	240.8	1.2
Breast	7	4.5	1.6	80	74.1	1.1
Partly breast	42	14.5	2.9	52	41.2	1.3
Artificial	119	65.6	1.8	150	124.7	1.2
Not reported		.9			.8	

[1] Expected if rates for each month of life and type of feeding found for infants whose mothers were not employed had prevailed among these infants.

Color and nationality of mother.

According to Table 130, a much larger proportion of the infants whose mothers were employed away from home than of either those whose mothers were employed at home or those whose mothers were not employed were of nationality groups which had high death rates—69.5 per cent as compared with 43.4 per cent and 26 per cent, respectively. In part, therefore, the excess in the mortality among the infants of mothers who were employed outside the home may have been due to the overweighting of this group with babies of nationalities which had unusually high rates.

When allowance was made in Table 131 for this correlation between mother's employment and nationality it was found, however, that the infants of mothers who were employed away from home still appeared to be subject to an excessively high death rate. In other words, when in each nationality group the rate for babies of employed mothers was compared with that for other babies a decided tendency toward greater mortality in the former group was observed.

TABLE 130.—*Proportion of births to mothers of nationalities with high infant mortality rates, by employment of mother during first year of infant's life; infants in seven cities*

Employment of mother during first year of infant's life	Live births—		
	Total	To mothers of nationalities with high infant mortality rates[1]	
		Number	Per cent
Total	21,536	6,904	32.1
Employed away from home	1,730	1,203	69.5
Employed at home	4,091	1,774	43.4
Place of employment not reported	1		
Not employed	15,714	4,082	26.0

[1] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored.

TABLE 131.—*Mortality among infants in eight cities whose mothers were employed during first year of infant's life as compared with average mortality in the same color and nativity groups*

Color and nativity of mother	Deaths of infants whose mothers during first year of infant's life were employed—					
	Away from home			At home		
	Actual	Expected[1]	Ratio of actual to expected	Actual	Expected[1]	Ratio of actual to expected
Total	168	96.7	1.7	282	281.4	1.0
White	129	69.0	1.9	261	253.7	1.0
Native	42	13.3	3.2	55	56.5	1.0
Foreign born	87	55.7	1.6	206	197.2	1.0
Colored	39	27.7	1.4	21	27.7	.8

[1] Expected at average rates for each month-of-life and each color-and-nationality group.

Earnings of father.

According to Table 132 a much larger proportion of the infants whose mothers were employed away from home during the infant's first year of life (79 per cent) than of those whose mothers were employed at home (54.1 per cent) or of those whose mothers were not employed (35.3 per cent) were born in families the fathers of which earned less than $650. In other words, a marked correlation was found between the prevalence of mother's employment and low father's earnings. The question is thus raised: Was the relatively high mortality among the infants of mothers who were employed away from home due to factors associated with low income from father's earnings or to factors associated with the employment of the mother?

When allowance was made in Table 133 for this interrelation between the mother's employment and the low income from father's earnings the mortality among infants whose mothers were employed away from home was still 1.6 times the average rate.

TABLE 132.—*Proportion of births in families in which father earned less than $650, by employment of mother during first year of infant's life; infants in seven cities*

Employment of mother during first year of infant's life	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	21,536	9,133	42.4
Employed away from home	1,730	1,367	79.0
Employed at home	4,091	2,214	54.1
Not employed [1]	15,715	5,552	35.3

[1] Including births to mothers for whom employment was not reported.

TABLE 133.—*Mortality among infants in seven cities whose mothers were employed during first year of infant's life as compared with average, by earnings of father*

Earnings of father	Deaths of infants whose mothers during first year of infant's life were employed—					
	Away from home			At home		
	Actual	Expected [1]	Ratio of actual to expected	Actual	Expected [1]	Ratio of actual to expected
Total	159	96.6	1.6	222	262.1	0.8
Less than $450	58	41.2	1.4	75	89.2	.8
$450–$549	32	18.2	1.8	37	49.0	.8
$550–$649	27	10.4	2.6	27	34.5	.8
$650–$849	15	7.6	2.0	35	44.5	.8
$850 and over	3	1.5	2.0	39	28.5	1.4
No earnings	18	14.4	1.3	7	9.3	.8
Not reported	6	3.3	1.8	2	7.1	.3

[1] Expected at average rates for each earnings group and month of life.

Causes of mother's employment during infant's life.

The causes which led to the employment of these mothers during their babies' first year of life were doubtless similar not only to those which bring about the employment of married women in general but also to those, already discussed, which led to the employment during pregnancy of mothers of infants included in this study (p. 138). That economic factors were primarily responsible is shown by the much greater proportion of mothers found to have been employed in the lowest as compared with the higher earnings-of-father group.[4] Under the same degree of economic pressure, however, a much smaller proportion of mothers went out to work during the infant's first year of life than during pregnancy. Besides low father's earnings the traditions and customs prevailing in each race and nationality group appeared to have exerted an influence over whether or not the mother sought gainful employment (pp. 119–121).

[4] See tables and discussion, pp. 160–161.

Summary.

The mother's employment at home during the infant's life, which was a possible influence over one-sixth of the total number of months under 1 year of age lived by all the babies included in the study, was found to have been associated with average mortality rates. The babies whose mothers worked at home received slightly more favorable feeding than was received by those whose mothers did not work at all, but the group was overweighted by infants of nationalities having high death rates and by infants whose fathers' earnings were low. When those tendencies were allowed for no excess mortality was found to have been associated with the mother's employment at home during the baby's life.

The infants of mothers who were employed away from home, on the other hand, had a death rate from all causes that was two and one-half times as high as the average and a rate from gastric and intestinal diseases that was over three times the average. This excess mortality was associated with and partially explained by a tendency toward early artificial feeding; but so far as this greater prevalence of artificial feeding was a consequence of the employment of the mother outside the home, the greater mortality due to the unfavorable feeding should be charged against such employment. The excess mortality was doubtless due in part also to the overweighting of the group with babies whose mothers belonged to nationalities which had high rates and especially with babies whose fathers' earnings were low. But even after allowances were made for these factors there remained an excess in the mortality of this group due probably to lack of the care which only the mothers who remained at home could give. In short, the mother's employment outside the home—which, however, affected only one-twentieth of the months under 1 year of age lived by all the babies in the study—seemed to have been definitely associated with an increased hazard to the baby.

EARNINGS OF FATHER

The figures for father's earnings used in the tabulations relate, as already stated, to the amount earned by the father of the family during the year immediately following the baby's birth. This information was secured in most cases from the mother. The mothers were asked not only as to the total amount but also as to wage rates and periods of unemployment and sickness. If discrepancies were found—for example, if the time at work at the stated wages would not have yielded the total amount said to have been earned—or if the mother could not give the information, the data were secured later from the father.

If the father had died or had deserted during the year following the child's birth, the amount recorded was that which he actually earned during that part of the year when he was contributing to the support of the family. In some such cases the amount of the father's earnings which the family had to live on was much below his normal earnings for a full year. In cases in which the father had died or deserted prior to the birth of the child, he was classified as having "no earnings." The cases included in these two groups were not numerous, but they are mentioned in order to emphasize the fact that the reports of earnings were not, and should not be interpreted as, statements of yearly wage rates.

In most of the cities studied the statements of earnings thus secured were not compared with pay-roll data, nor was information obtained from employers. In the city of Manchester, however, where a very large proportion of the fathers of infants included in the study were employed in the textile mills, the mothers' statements as to fathers' earnings were compared with the amounts as shown on the pay rolls. For this city it was found that, when the births and deaths were classified according to fathers' earnings as stated by the mothers, the results were substantially the same as when they were classified according to amounts shown by the pay rolls; on the whole, however, the statements of the mothers tended to exaggerate slightly the amounts received.[5]

Besides data on the father's earnings, information was secured as to the amounts earned by the mother and by other members of the family and as to other sources of income. The information obtained on these points, however, was not considered so reliable as that on father's earnings. The earnings of mothers, for example, were derived largely from keeping lodgers and boarders, and when this was the source it was difficult to separate the net from the gross receipts. In determining total family income, moreover, not only were net receipts difficult to secure in some cases—for example, of income from rents of houses owned but not lived in by the families—but also perplexing questions arose as to whether a given item—for example, money borrowed or money returned—constituted true income. Futhermore, difficulties in comparing incomes arose from the fact that some families had invested their savings in the homes occupied by them and, though neither receiving nor paying rent, had incurred various expenses connected with such ownership, and others had invested their savings in such a way as to secure a definite cash income. For the purposes of this study the amount which it would have been most desirable to know was the portion of the income spent for the maintenance of the family, or, better still, the portion actually expended for the infant's maintenance and in ways that would influence the infant's health, including expenditures for the health of the mother. Since, however, this amount could not be ascertained and even the total family income was subject to much doubt, the data on father's earnings appeared to furnish the nearest approximation to a satisfactory measure of the effect of economic status on infant mortality. These data, therefore, have been used as the principal basis of classification, though the correlations of father's earnings, total income, and father's earnings per capita of the family with certain details of care of the infant and of the mother's prenatal and confinement care are pointed out in the course of the discussion.

All these data relating to amounts of earnings, it should be emphasized, were secured before the marked rise in prices and wages during and following the war. Since the time from the first to the last study of the series was relatively short (about three years) the figures for annual earnings in the different cities, so far as changes in the level of prices and wages is concerned, may be considered fairly comparable.

Classifying the births and deaths according to the earnings of the father during the year immediately following the birth, Table 134

[5] Since the material is used simply to show the correlation between earnings and mortality, a uniform error of overstatement would not affect the validity of the conclusion.

shows a marked relationship between infant mortality and father's earnings. The higher the earnings the smaller was the proportion of deaths. For infants whose fathers earned less than $450 the rate was 166.9, as compared with only 59.1 for those whose fathers earned $1,250 or over. The group of babies whose fathers were classified as having "no earnings" had the highest rate of all (210.9).

TABLE 134.—*Infant mortality rates, by cause of death and earnings of father; live births in seven cities*

Earnings of father	Live births	Infant deaths	Infant mortality rates [1]						Neonatal mortality rates [2]
			All causes	Gastric and intestinal diseases	Respiratory diseases	Early infancy	Epidemic and other communicable diseases	Other causes	
Total	21,536	2,368	110.0	32.3	19.2	35.9	6.8	15.7	44.4
Less than $450	3,085	515	166.9	60.6	33.4	43.8	12.3	16.9	55.8
$450–$549	2,827	355	125.6	44.9	23.3	35.4	6.4	15.6	46.0
$550–$649	2,908	339	116.6	36.5	18.9	37.5	9.3	14.4	43.3
$650–$849	5,050	543	107.5	27.1	19.6	37.4	5.5	17.8	46.5
$850–$1,049	3,345	277	82.8	19.7	13.5	30.2	4.2	15.2	38.0
$1,050–$1,249	1,391	89	64.0	8.6	7.9	25.9	3.6	18.0	33.1
$1,250 and over	2,252	133	59.1	8.0	6.2	32.4	2.2	10.2	38.2
No earnings	313	66	210.9	86.3	47.9	41.5	16.0	19.2	60.7
Not reported	365	51	139.7	41.1	16.4	49.3	16.4	16.4	41.1

[1] Deaths under 1 year per 1,000 live births. [2] Deaths under 1 month per 1,000 live births.

The distribution of births in the several father's earnings groups is shown also in Table 134. A striking fact was the small proportion—only 10.5 per cent—of the infants studied who were born in families in which the father earned $1,250 or more. On the other hand, 41 per cent were born in families in which the father earned less than $650.

Additional income.

In practice the father's earnings, except perhaps in the comparatively small group in which they exceeded $1,250, constituted in the vast majority of cases by far the largest part of the family's income and in fact may be said to have determined its economic status. In Baltimore, for example, only 7 per cent of the families had any income from insurance, investments, or rents from tenants outside their own dwellings; the proportion having such income was greatest, as would be expected, for families which on the basis of father's earnings were classed in the "$1,250 and over" income group.[6] In a considerable proportion (23 per cent) of the families in this city the earnings of the father were supplemented by those of the mother or the children, but the amounts of these supplementary earnings were small. In about half the cases the mother's gross earnings were less than $150. (See General Table 90, p. 229.) The amounts reported for the children were on an average higher; in about half the cases the total earnings of all the children in the family who worked amounted to $300 or over. (See General Table

[6] See Infant Mortality—Results of a Field Study in Baltimore, Md., based on births in one year, by Anna Rochester, p. 35 (U. S. Children's Bureau Publication No. 119, Washington, 1923).

91, p. 229.) If the classification had been based on family income instead of father's earnings about one-fifth of the entire number of infants would have been placed in higher groups, but the other four-fifths would have been placed in the same groups by either method. (See General Table 92, p. 230.)

Classifying the births both by father's earnings and by total family income indicated, surprising as it may appear, that in families with equal incomes from father's earnings the infant mortality rate was higher the more was contributed to the income from other sources—in the majority of cases, the earnings of the mother or of older children. (See General Table 92, p. 230.) This is doubtless explained in part by the influence of the mother's employment in increasing infant mortality and in part by such factors as high order of birth for infants in families which had children old enough to be employed.

Earnings per capita of family.

The significance of father's earnings as indicating economic pressure is shown in Table 135, which sets forth the correlation between the amounts of these earnings and their distribution per capita of the family. The estimated median per capita income from father's earnings increased from $101 for the group "under $450" to $338 for the group "$1,050 to $1,249." [7]

Since the average number in the family was slightly greater for the lower than for the higher father's earnings groups, the variation in economic pressure appeared slightly greater than the variations in the earnings themselves. In other words, as the father's earnings decreased the economic pressure increased at a slightly more rapid rate. In general the lower the earnings the greater was the economic pressure as indicated by their distribution per capita.

TABLE 135.—*Proportion of births in families with per capita income from father's earnings of less than $100, and median earnings per capita, by earnings of father; live births in seven cities* [a]

Earnings of father	Live births—			
	Total	In families with per capita income of less than $100 [b]		Median per capita income [b]
		Number	Per cent	
Total	18,587	[c] 3,175	17.1	$177
Less than $450	3,077	1,508	49.0	101
$450–$549	2,826	853	30.2	129
$550–$649	2,905	513	17.7	161
$650–$849	5,047	256	5.1	234
$850–$1,049	3,341	43	1.3	265
$1,050–$1,249	1,391	2	.1	338

[a] For basic figures see General Table 93, p. 230.

[b] From earnings of father only.

[c] Excluding births in families in which fathers earned nothing or $1,250 and over, and those for which earnings or number in family were not reported.

[7] For this calculation the group "$1,250 and over" was not considered; for the rest the father's earnings in each family were assumed to be equal to the middle point in the group in which the family was classed—$500 for the families in the group $450 to $549, $600 for the group $550 to $649, etc.—and the per capita income was found by dividing by the number of members reported for each family. For the group "under $450" an arbitrary sum of $400 was set as the approximate average earnings for purposes of this calculation.

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Though the differences between father's earnings groups may therefore be taken as indicating differences in average per capita income or in average economic pressure, in each of these groups were included some families that would have been placed in a relatively higher, and others that would have been placed in a relatively lower, position on a per capita income scale than on the father's earnings scale. If the families were all classified, therefore, on a per capita income scale the true influence of economic pressure as a factor in infant mortality would be more clearly presented.

In Table 136 the result of a classification by per capita income from father's earnings is presented for all the infants born in families in which the father earned less than $1,250; that is, for those groups in which the father's earnings most closely represented family income. The relationship shown by this grouping between economic pressure and the infant mortality rate was even more striking—as indeed would be expected—than that shown when no account was taken of the number of members in the family. The conclusion seems justified, therefore, that an analysis based on father's earnings alone yields substantially the same results as an analysis based on father's earnings per capita of his household and in fact gives trustworthy evidence as to the relation of economic need to mortality among the infants studied. The following discussion, therefore, is in terms of father's earnings, except where the number in the family has to be taken into consideration as one of the items of the analysis.

TABLE 136.—*Infant mortality rates, by per capita income as measured by average earnings of father per capita of household; live births in seven cities*

Per capita income from father's earnings	Live births	Infant deaths	Infant mortality rates [1]
Total	21,536	2,368	110.0
Less than $50	227	49	215.9
$50–$99	2,948	418	141.8
$100–$199	6,900	850	123.2
$200–$399	8,000	769	96.1
$400 and over	512	31	60.5
Not classified:			
Father's earnings less than $1,250—number in family not reported [2]	19	1	
Father's earnings $1,250 and over	2,252	133	59.1
No father's earnings	313	66	210.9
Earnings not reported	365	51	139.7

[1] Not shown where base is less than 100.
[2] Including also a few cases in which the infant was in an institution.

Causes of death of infant.[8]

Not only did the general rate of infant mortality decrease as the earnings of the fathers increased, but with one or two exceptions the rates from the several causes, exhibited the same tendency as Table 133 shows. The mortality from gastric and intestinal diseases showed perhaps the most marked variation by earnings, the rate in the lowest-earnings group "under $450" being seven and one-half times that in the highest ("$1,250 and over").[9]

[8] For classification by cause of death and per capita income from father's earnings see General Table 94, p. 231.
[9] But not even in the highest-earnings group did the mortality from these causes approach the low rate of 4.9 prevailing in New Zealand in 1915.

The mortality from respiratory diseases likewise showed a marked negative correlation with father's earnings. For the infants of fathers who earned less than $450 the rate was 33.4, as compared with 6.2 (less than one-fifth as high) for those of fathers who earned $1,250 and over. As would be expected, the mortality among the babies whose fathers were reported to have had no earnings was highest of all.

From epidemic diseases the lowest mortality was found to have been in the father's earnings group "$1,250 and over" and the highest in the two groups "no earnings" and "under $450." Likewise from causes peculiar to early infancy the rates were higher for the infants of fathers who had the lowest earnings than for those of fathers who earned $850 and over.

Neonatal mortality.

The neonatal mortality rate (deaths in the first month per 1,000 live births) showed, according to Table 137, the same marked correlation with father's earnings. This rate was 60.7 in the "no earnings" group and 55.8 in the group "under $450," but only 33.1 for the infants of fathers who earned $1,050 to $1,249. It was slightly higher (38.2) in the group "$1,250 and over." [10]

TABLE 137.—*Neonatal mortality rates, by earnings of father; live births in seven cities*

Earnings of father	Total live births	Deaths under 1 month	Neonatal mortality rates	Earnings of father	Total live births	Deaths under 1 month	Neonatal mortality rates
Total	21,536	956	44.4	$850–$1,049	3,345	127	38.0
				$1,050–$1,249	1,391	46	33.1
Less than $450	3,085	172	55.8	$1,250 and over	2,252	86	38.2
$450–$549	2,827	130	46.0	No earnings	313	19	60.7
$550–$649	2,908	126	43.3	Not reported	365	15	41.1
$650–$849	5,050	235	46.5				

Plural births, prematurity, and death of mother.

No significant differences appeared between the several earnings groups in the occurrence of plural births. (See General Table 93, p. 232.) According to Table 138, the proportion of premature births was slightly larger for the group "$1,250 and over" than for any of the others except the "no earnings" group. A slight correlation was found between low earnings and a high death rate of mothers during the year after confinement, the proportion of such deaths being 6.6 per 1,000 for the "less than $850" group as compared with 4 for that "$850 and over." (See General Table 97, p. 232.) All these differences were comparatively slight, and in part they offset each other; they did not, therefore, play any significant part in the marked correlation between economic pressure and the infant mortality rate.

[10] See General Table 95, p. 231, for rates in other months.

TABLE 138.—*Proportion of premature births, by earnings of father; live births in eight cities*

Earnings of father	Live births			Earnings of father	Live births		
	Total	Premature			Total	Premature	
		Number	Per cent			Number	Per cent
Total	21,536	1,111	5.2	$850–$1,049	3,345	180	5.4
				$1,050–$1,249	1,391	78	5.6
Less than $450	3,085	144	4.7	$1,250 and over	2,252	138	6.1
$450–$549	2,827	124	4.4	No earnings	313	26	8.3
$550–$649	2,908	141	4.8	Not reported	365	21	5.8
$650–$849	5,050	259	5.1				

Age of mother, order of birth, interval since preceding birth, and interval before succeeding pregnancy.

Low economic status was found, according to Tables 139, 140, and 141, to be correlated with each of the four factors associated with birth frequency. The low-earnings groups included a disproportionate number of infants of orders fifth and later; of those born to mothers under 20, or 35 years of age and over; of those born at short intervals after preceding births; and of those whose mothers became pregnant during the infants' first year of life—all four divisions which had higher than average mortality rates. In no case, however, was there any very great difference between earnings groups in the proportions of births in these four divisions. The percentages of infants born to mothers under 20, or 35 years of age or over, varied only from 30.7 for those whose fathers were classified as having had no earnings to 20.1 for those whose fathers earned $850 to $1,049. For short-interval births the percentages varied from 29.4 in the group "under $450" to 20.4 in that "$1,250 and over." For infants whose mothers became pregnant during the infants' first year of life the proportion varied from 16.2 per cent in the group "under $450" to 7.9 per cent in that "$1,250 and over."[11]

TABLE 139.—*Proportion of births to mothers under 20 and to those 35 years of age and over, and of births fifth and later in order, by earnings of father; live births in seven cities* [a]

Earnings of father	Live births—				
	Total	To mothers under 20, and 35 and over		Fifth and later in order	
		Number	Per cent	Number	Per cent
Total	21,536	4,895	22.7	5,530	25.7
Less than $450	3,085	849	27.5	1,064	34.5
$450–$549	2,827	688	24.3	853	30.2
$550–$649	2,908	692	23.8	810	27.9
$650–$849	5,050	1,051	20.8	1,212	24.0
$850–$1,049	3,345	673	20.1	697	20.8
$1,050–$1,249	1,391	293	21.1	283	20.3
$1,250 and over	2,252	469	20.8	408	18.1
No earnings	313	96	30.7	92	29.4
Not reported	365	84	23.0	111	30.4

[a] For basic figures see General Tables 24 and 32, pp. 196 and 199.

[11] In the "no earnings" group, including families in which the father died or deserted before the infant's birth or was sick or unemployed during the entire year, only 1.4 per cent of the mothers became pregnant during the infant's first year.

TABLE 140.—*Proportion of short-interval births,[1] by earnings of father; live births in Baltimore[2]*

Earnings of father	Live births second and later in order—			Earnings of father	Live births second and later in order—		
	Total	Following preceding births at short intervals[1]			Total	Following preceding births at short intervals[1]	
		Number	Per cent			Number	Per cent
Total	7,929	2,072	26.1	$850–$1,049	1,128	280	24.8
				$1,050–$1,249	476	105	22.1
Less than $450	1,228	361	29.4	$1,250 and over	854	174	20.4
$450–$549	1,124	316	28.1	No earnings	148	35	23.6
$550–$649	1,101	298	27.1	Not reported	157	43	27.4
$650–$849	1,713	460	26.9				

[1] For definition of interval see p. 60. [2] For basic figures see General Table 38, p. 201.

TABLE 141.—*Proportion of births to mothers who became pregnant during first year of infant's life, by earnings of father; live births in Baltimore*

Earnings of father	Live births—			Earnings of father	Live births—		
	Total	To mothers who became pregnant during first year of infant's life[1]			Total	To mothers who became pregnant during first year of infant's life[1]	
		Number	Per cent			Number	Per cent
Total	10,797	1,232	11.4	$850–$1,049	1,595	143	9.0
				$1,050–$1,249	661	55	8.3
Less than $450	1,544	250	16.2	$1,250 and over	1,221	96	7.9
$450–$549	1,449	195	13.5	No earnings	207	3	1.4
$550–$649	1,489	190	12.8	Not reported	214	32	15.0
$650–$849	2,417	268	11.1				

[1] Omitting cases of infants who died in the same month in which mother became pregnant.

The most marked variations were found between the percentages of births of orders fifth and later, which varied from 34.5 in the earnings group "under $450" to only 18.1 in that "$1,250 and over."

Not only were these differences comparatively small, but to a certain extent the four factors, order of birth, age of mother, interval since preceding birth, and interval before succeeding pregnancy, were interrelated. Births of high orders were commonly to older mothers and were frequently associated with short intervals.

Eliminating the influence of age of mother and order of birth, as Table 142 shows, did not alter materially the marked correlation between low father's earnings and a high infant mortality rate. Similarly, when the influence of interval since the preceding birth was eliminated, the relative mortality in the several earnings groups was not materially altered. The rate for the "no earnings" group appeared relatively higher and that for the group "under $450" relatively slightly lower, while most of the other rates appeared not to be significantly affected. No correction was attempted for interval before succeeding pregnancy, since the proportion of the months lived by all infants which were lived after the commencement of a succeeding pregnancy was so small that this factor could not have exerted any appreciable influence (p. 67).

TABLE 142.—*Relative infant mortality, by earnings of father, when influence of age of mother and order of birth, and influence of interval since preceding birth, are eliminated; seven cities and Baltimore* [1]

Earnings of father	Ratio of actual to expected deaths (per cent)			
	Seven cities		Baltimore	
	Expected at average rates for single births	Expected at rates for same order-of-birth and age-of-mother group	Expected at average rates for all births	Expected at rates for births at same interval since preceding birth
Total	100.0	100.0	100.0	100.0
Less than $450	152.8	142.5	151.4	140.3
$450–$549	113.5	108.8	114.0	116.9
$550–$649	103.0	101.1	105.1	100.5
$650–$849	98.0	98.8	92.8	96.5
$850–$1,049	75.4	78.1	69.1	66.1
$1,050–$1,249	59.0	61.9	64.3	66.9
$1,250 and over	54.5	59.6	62.5	60.8
No earnings	200.0	191.6	200.7	211.4
Not reported	130.1	128.6	135.5	131.1

[1] For basic figures see General Table 98, p. 232.

With reference to order of birth, which is closely related to the number in the family, the father's earnings seem especially inappropriate as an index of economic pressure. Accordingly, for this correlation an analysis is made in Table 143 to show the relative mortality in the groups with varying economic pressure after the influence of order of birth is eliminated. A study of this table shows that even after the elimination of order of birth as a factor the mortality in the group with the smallest per capita income from father's earnings, "less than $50," was over twice as high as in the group with the largest per capita income, "$400 and over."

TABLE 143.—*Relative mortality, by economic need,[1] when influence of order of birth is eliminated; live births in seven cities*

Per capita income from father's earnings	Infant deaths		
	Actual	Expected[2]	Ratio of actual to expected (per cent)
Total	2,117	2,117.0	100.0
Less than $50	49	37.5	130.7
$50–$99	418	395.9	105.6
$100–$199	850	785.0	108.3
$200–$399	769	843.8	91.1
$400 and over	31	54.8	56.6

[1] As measured by the average amount of father's earnings per capita of family.
[2] Expected at average rate for each order of birth irrespective of per capita income from father's earnings.

Type of feeding.[12]

An answer to the question as to whether the high mortality rate among infants of fathers whose earnings were low was due to an unusual prevalence of artificial feeding is given in Table 144. This table shows that, on the contrary, exclusively artificial feeding was less prevalent in the low than in the high earnings groups; of the months lived from birth to the end of the ninth by babies whose fathers earned less than $450, 22 per cent were months of artificial feeding, as compared with 30 per cent of those lived by babies whose fathers earned $1,250 and over. The variations in the prevalence of exclusively breast feeding were slight, the group "$850 to $1,049" having the largest percentage (58.6) and the highest-earnings group having the smallest (55.3) except that of the "no earnings" group, in which many mothers went out to work (46.8). The variations in the prevalence of partially breast feeding were more marked; the "no earnings" group had the highest proportion (21.7 per cent), and the group "$1,050 to $1,249" had the lowest (14.2 per cent). Since the disadvantages associated with the use of artificial food are much greater when it is used exclusively than when it is used only to supplement the mother's milk, it is evident that the babies in the lower-earnings groups had more favorable feeding than those in the higher. The excessive mortality in the former occurred in spite of a smaller proportion of infants who were artificially fed. A correction for the varying prevalence of artificial feeding, therefore, would tend to increase the relatively high mortality associated with low earnings.

TABLE 144.—*Prevalence of exclusively artificial feeding, by earnings of father; months lived from birth to end of ninth; infants in seven cities*[1]

Earnings of father	Per cent of months lived from birth to end of ninth			Earnings of father	Per cent of months lived from birth to end of ninth		
	Breast fed	Partly breast fed	Artificially fed		Breast fed	Partly breast fed	Artificially fed
Total	57.0	17.4	25.6	$850–$1,049	58.6	14.9	26.4
				$1,050–$1,249	56.5	14.2	29.3
Less than $450	56.7	21.1	22.0	$1,250 and over	55.3	14.7	30.0
$450–$549	57.2	21.3	21.5	No earnings	46.8	21.7	31.5
$550–$649	57.0	18.3	24.7	Not reported	50.3	18.5	31.0
$650–$849	57.8	16.1	26.1				

[1] For basic figures see General Table 100, p. 234.

The relative mortality by father's earnings is shown in Table 145 for breast-fed, partly breast-fed, and artificially-fed infants separately. The greatest contrast was found among the artificially fed; the death rate for babies thus fed whose fathers earned less than $450 was over five times that for such babies whose fathers earned $1,250 and over. Among the breast-fed babies, on the other hand, the rate for the lowest was slightly over three times that for the highest earnings group. In each type-of-feeding group a marked correlation was found between low earnings and high mortality.

[12] See General Tables 99, 100, and 101, pp. 233, 234, 235.

TABLE 145.—*Relative mortality, by earnings of father, among breast-fed, partly breast-fed, and artificially-fed infants in seven cities*

Earnings of father	Deaths among—								
	Breast-fed infants			Partly breast-fed infants			Artificially-fed infants		
	Actual	Expected [1]	Ratio (per cent)	Actual	Expected [1]	Ratio (per cent)	Actual	Expected [1]	Ratio (per cent)
Total	600	599.7	100.0	246	245.7	100.0	1,002	1,001.5	100.0
Less than $450	142	84.8	167.5	69	40.7	169.5	220	120.4	182.7
$450–$549	84	79.3	105.9	42	42.4	99.1	161	110.2	146.1
$550–$649	78	81.4	95.8	43	31.1	138.3	152	129.7	117.2
$650–$849	162	141.9	114.2	42	53.0	79.2	219	239.9	91.3
$850–$1,049	60	95.5	62.8	21	33.4	62.9	117	163.1	71.7
$1,050–$1,249	23	38.7	59.4	5	13.8	36.2	32	74.9	42.7
$1,250 and over	31	61.8	50.2	7	22.8	30.7	42	125.1	33.6
No earnings	10	7.2	138.9	9	4.2	214.3	38	17.5	217.1
Not reported	10	9.1	109.9	8	4.3	186.0	21	20.7	101.4

[1] Expected at average rates in each month for all infants receiving specified type of feeding.

Color and nationality of mother.

A marked correlation between low earnings and a large proportion of births to mothers of nationalities for which the infant mortality rates were high appears in Table 146. Of the babies whose fathers earned less than $450, 55 per cent as compared with only 10 per cent of those whose fathers earned $1,250 or over, were born to mothers who belonged to nationalities which had high infant death rates. This close correlation suggests the importance of ascertaining to what extent the high mortality in the low-earnings groups may have been due to the association of low earnings with nationalities which had high rates.

That this correlation with nationalities which had high infant mortality rates accounted for but a relatively small part of the excess mortality associated with low earnings is apparent from Table 147. In each of the principal color and nativity groups, the native white, the foreign-born white, and the colored, the relation between low earnings and high infant mortality was striking. And among the native white infants alone—a group uninfluenced by any disproportionate weighting with colored or with foreign nationalities—the relation between mortality and father's earnings was even more striking than in the entire group studied. Furthermore, the differences between the average infant mortality rates of the three race and nativity groups appeared to have resulted largely from the unfavorable weighting of the foreign-born white and the colored with disproportionate numbers of infants in the low-earnings groups; for the differences between the rates for the infants of the foreign-born and colored mothers were relatively slight when comparisons were made of groups in which earnings were substantially equal. The high rate of 166.9 in the earnings group "under $450," for example, was not increased by the inclusion of a disproportionate number of infants of colored mothers; in fact, in this particular earnings group the rate for such infants was not so high as that for the infants of native white mothers. The conclusion may fairly be drawn, there-

fore, that the relationship found between low father's earnings and high infant mortality was independent of the correlation between low earnings and color and nationality.[13]

TABLE 146.—*Nationality of mother, by earnings of father; live births in seven cities* [1]

Earnings of father	Live births—			Earnings of father	Live births—		
	Total	To mothers of nationalities with high infant mortality rates.[2]			Total	To mothers of nationalities with high infant mortality rates.[2]	
		Number	Per cent			Number	Per cent
Total	21,536	6,904	32.1	$850–$1,049	3,345	672	20.1
				$1,050–$1,249	1,391	197	14.2
Less than $450	3,085	1,697	55.0	$1,250 and over	2,252	225	10.0
$450–$549	2,827	1,362	48.2	No earnings	313	132	42.2
$550–$649	2,908	1,046	36.0	Not reported	365	123	33.7
$650–$849	5,050	1,450	28.7				

[1] For basic figures see General Table 76, p. 221.
[2] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored.

TABLE 147.—*Infant mortality rates, by color and nativity of mother and earnings of father; live births in seven cities* [1]

Earnings of father	Infant mortality rates			
	Total	Color and nativity of mother		
		Native white	Foreign-born white	Colored [2]
Average	110.0	93.9	123.7	152.3
Less than $450	166.9	170.0	167.1	162.7
$450–$549	125.6	121.0	118.4	163.7
$550–$649	116.6	110.8	121.8	122.8
$650–$849	107.5	99.5	119.6	102.7
$850–$1,049	82.8	76.4	94.9	
$1,050–$1,249	64.0	62.6	68.4	
$1,250 and over	59.1	57.6	60.0	
No earnings	210.9	187.5	234.2	
Not reported	139.7	154.7	129.5	

[1] For basic figures see General Table 102, p. 236.
[2] Not shown where base is less than 100.

Housing congestion.

A striking correlation was found, as Table 148 shows, between low income and housing congestion. Of the infants who survived for at least two weeks 77.2 per cent of those whose fathers earned less than $450, as compared with only 17.5 per cent of those whose fathers earned $1,250 and over, were found in families which lived one or more persons per room.

When allowance was made in Table 149 for this correlation, the increase in the mortality as the father's earnings fell appeared quite as striking as before the correction was made.

[13] A separate analysis of the rates by nationality of the foreign-born group leads to a similar conclusion; namely, that the relationship between low earnings and high infant mortality rates was, on the average, practically as marked within each nationality group as in the group as a whole.

TABLE 148.—*Prevalence of overcrowding, by earnings of father; infants in seven cities* [1]

Earnings of father	Infants surviving two weeks—			Earnings of father	Infants surviving two weeks—		
	Total	In families living 1 or more persons per room.			Total	In families living 1 or more persons per room.	
		Number	Per cent			Number	Per cent
Total	20,698	9,730	47.0	$850–$1,049	3,229	1,038	32.1
				$1,050–$1,249	1,347	353	26.2
Less than $450	2,943	2,124	72.2	$1,250 and over	2,173	381	17.5
$450–$549	2,719	1,702	62.6	No earnings	291	190	65.3
$550–$649	2,799	1,589	56.8	Not reported	341	164	48.1
$650–849	4,856	2,189	45.1				

[1] For basic figures see General Table 80, p. 224.

TABLE 149.—*Relative mortality, by earnings of father, when influence of housing congestion is eliminated; infants in seven cities surviving two weeks* [1]

Earnings of father	Infant deaths			Earnings of father	Infant deaths		
	Actual	Expected [2]	Ratio of actual to expected (per cent)		Actual	Expected [2]	Ratio of actual to expected (per cent)
Total	1,566	1,566.4	100.0	$850–$1,049	163	216.8	75.2
				$1,050–$1,249	49	86.5	56.6
Less than $450	378	269.9	140.1	$1,250 and over	57	130.8	43.6
$450–$549	249	228.9	108.8	No earnings	50	25.5	196.1
$550–$649	234	226.1	103.5	Not reported	34	26.0	130.8
$650–$849	352	355.9	98.9				

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).
[2] Expected if in each group classified by earnings of father and number of persons per room the average rate in the corresponding persons per room group had prevailed.

Employment of mother during pregnancy.

The evidence presented in Table 150 shows that a close relationship existed between low earnings of the father and employment of the mother. The proportion of mothers employed away from home during pregnancy was highest—37.4 per cent—in the "no earnings" group, was 28.3 per cent in the group "under $450," and was lowest—1.9 per cent—in the group "$1,250 and over." The high mortality in the low-earnings groups was slightly increased, therefore, by the high mortality among the babies of mothers who worked away from home.

That this effect, however, was not great is clear from Table 151, which shows that the mortality in the low-income groups was relatively almost as high, as compared with that in the high-income groups, among infants of mothers who were not employed as among those of mothers who were employed away from home, though in all earnings groups the former had lower rates than the latter.

TABLE 150.—*Prevalence of employment of mothers during pregnancy, by earnings of father; live births in seven cities*

Earnings of father	Live births—						
	Total	To mothers employed during pregnancy—					
		Total		At home		Away from home	
		Number	Per cent	Number	Per cent	Number	Per cent
Total	21,536	6,606	30.7	3,535	16.4	3,071	14.3
Less than $450	3,085	1,637	53.1	765	24.8	872	28.3
$450–$549	2,827	1,248	44.1	599	21.2	649	23.0
$550–$649	2,908	995	34.2	466	16.0	529	18.2
$650–$849	5,050	1,265	25.0	718	14.2	547	10.8
$850–$1,049	3,345	661	19.8	459	13.7	202	6.0
$1,050–$1,249	1,391	207	14.9	165	11.9	42	3.0
$1,250 and over	2,252	264	11.7	221	9.8	43	1.9
No earnings	313	176	56.2	59	18.8	117	37.4
Not reported	365	153	41.9	83	22.7	70	19.2

TABLE 151.—*Infant mortality rates, by mother's employment during pregnancy and earnings of father; live births in seven cities*

Earnings of father	Mothers employed during pregnancy			Mothers not employed during pregnancy		
	Live births	Infant deaths	Infant mortality rates	Live births	Infant deaths	Infant mortality rates
Total	6,606	926	140.2	14,930	1,442	96.6
Less than $450	1,637	303	185.1	1,448	212	146.4
$450–$549	1,248	168	134.6	1,579	187	118.4
$550–$649	995	137	137.7	1,913	202	105.6
$650–$849	1,265	145	114.6	3,785	398	105.2
$850–$1,049	661	75	113.5	2,684	202	75.3
$1,050–$1,249	207	19	91.8	1,184	70	59.1
$1,250 and over	264	20	75.8	1,988	113	56.8
No earnings	176	38	215.9	137	28	204.4
Not reported	153	21	137.3	212	30	141.5

The responsibility of low father's earnings, apart from that of customs and traditions associated with nationality, for the employment of the mother is shown in Table 152.[13] This table indicates clearly, as would be expected, that low earnings of the father must be considered to have been a primary factor in causing the mother to seek employment away from home.

[13] For the influence of such customs and traditions apart from that of low father's earnings see discussion, pp. 117 and 119.

TABLE 152.—*Prevalence of mother's employment away from home during pregnancy, by earnings of father, when influence of nationality of mother as a factor in mother's employment is eliminated; live births in seven cities*

Earnings of father	Live births to mothers employed away from home during pregnancy			Earnings of father	Live births to mothers employed away from home during pregnancy		
	Actual	Expected [1]	Ratio of actual to expected (per cent)		Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	3,071	3,071.4	100.0	$850–$1,049	202	356.0	56.7
				$1,050–$1,249	42	131.3	32.0
Less than $450	872	659.3	132.3	$1,250 and over	43	196.8	21.8
$450–$549	649	536.1	121.1	No earnings	117	58.8	199.0
$550–$649	529	440.6	120.1	Not reported	70	55.4	126.4
$650–$849	547	637.1	85.9				

[1] Expected if the proportion of mothers employed away from home during pregnancy in each nationality group were applied to the live-born infants classified by father's earnings and mother's nationality.

Employment of mother during first year of infant's life.

In Table 153 the prevalence of employment of the mother during some part of the first year of the infant's life is shown to have varied with the father's earnings. The proportion of mothers employed away from home was highest—38 per cent—in the "no earnings" group, was 19.6 per cent in the group "under $450," and was lowest—0.6 per cent—in the two groups "$1,050 to $1,249" and "$1,250 and over." As in the case of employment during pregnancy the higher-earnings groups had very few mothers employed away from home; and in each such group a much smaller proportion of mothers were found to have been employed away from home during the infant's first year than were found to have been so employed during pregnancy.

The percentages of mothers who were employed at some time during the infant's first year of life, however, tend to overstate the actual importance which such employment may have had as a factor in the infant mortality rate (see also pp. 139–140), since a case in which the mother resumed work at the eleventh month was counted in the same way as was one in which she resumed work at the third, though obviously the possible influence upon the health of the child was much greater in the latter than in the former case. Of the total number of months lived by infants in the several earnings groups the proportion lived by babies after their mothers went to work away from home varied from 12.1 per cent in the group "under $450" to 0.4 per cent in the group "$1,250 and over." In fact, in view of the small proportion of the first year of life lived by infants while their mothers were employed away from home, the correction for such employment appeared to be of comparatively minor importance. The high mortality found among the infants in the low-earnings groups must have been due not only to a high mortality among the babies whose mothers were employed but also to a high mortality among those whose mothers were not employed.

TABLE 153.—*Prevalence of mother's employment at home and away from home during first year of infant's life, by earnings of father; infants in seven cities*

Earnings of father	Live births—						
	Total	To mothers employed at some time during first year of infant's life—					
		Total		At home		Away from home	
		Number	Per cent	Number	Per cent	Number	Per cent
Total	21,536	5,821	27.0	4,091	19.0	1,730	8.0
Less than $450	3,085	1,506	48.8	900	29.2	606	19.6
$450–$549	2,827	1,080	38.2	692	24.5	388	13.7
$550–$649	2,908	803	27.6	549	18.9	254	8.7
$650–$849	5,050	1,088	21.5	854	16.9	234	4.6
$850–$1,049	3,345	567	17.0	516	15.4	51	1.5
$1,050–$1,249	1,391	196	14.1	187	13.4	9	.6
$1,250 and over	2,252	247	11.0	233	10.3	14	.6
No earnings	313	192	61.3	73	23.3	119	38.0
Not reported	365	142	38.9	87	23.8	55	15.1

Table 154 shows the importance of low earnings of the father as a factor in causing the mother to seek employment outside the home during the infant's first year of life after the influence of customs and traditions associated with nationality was eliminated. Though in every earnings group the mothers appeared to have sought work away from home less frequently during the infant's first year of life than during pregnancy, the variations between the proportions in the several earnings groups seemed more marked than in the case of the mother's employment during pregnancy. Apparently the need of additional income must have had to be greater for the mothers to seek work during the life of the baby than for them to seek it during pregnancy, a fact which may perhaps be explained by the care and attention required by the young baby.

TABLE 154.—*Prevalence of mother's employment away from home during first year of infant's life, by earnings of father, when influence of nationality as a factor in mother's employment is eliminated; infants in seven cities*

Earnings of father	Live births to mothers employed away from home during first year of infant's life		
	Actual	Expected [1]	Ratio of actual to expected (per cent)
Total	1,730	1,730.4	100.0
Less than $450	606	403.6	150.1
$450–$549	388	320.9	120.9
$550–$649	254	246.9	102.9
$650–$849	234	338.8	69.1
$850–$1,049	51	183.2	27.8
$1,050–$1,249	9	66.4	13.6
$1,250 and over	14	100.8	13.9
No earnings	119	37.1	320.4
Not reported	55	32.6	168.6

[1] Expected if the proportions of mothers employed away from home during first year of infant's life in each nationality group were applied to the live-born infants classified by father's earnings and mother's nationality.

Chain of causation linking earnings of father and infant mortality.

The influence of the father's earnings upon his infant's chances of life was exerted through the relation of the family's economic status to the mother's health and care during pregnancy and confinement and to the care of the baby during his first year.

An intimate connection was found, as Table 155 shows, between father's earnings and the extent and quality of prenatal care in the one city (Baltimore) for which information on these points was secured. Thus 53 per cent of the mothers in the group "under $450" had no medical prenatal care as compared with only 13.8 per cent of those in the group "$1,850 and over." Of the mothers in the lowest-earnings group 35.7 per cent were not attended by a physician at confinement as compared with only 6.6 per cent of those in the highest. Nursing care during the confinement period was received by 37.2 per cent of the mothers in the lowest group as compared with only 7.5 per cent of those in the highest. And the proportion of mothers who stayed in bed or in a hospital for less than seven days after delivery varied from 12.8 in the lowest to 1.7 per cent in the highest earnings group.

Though ignorance of the rules of health in the poorer families doubtless played some part in producing these differences, the obvious relation between lack of means and failure to obtain medical and nursing services and competent advice or to follow out that advice suggests that lack of means, or economic pressure, must have borne a heavy responsibility.

TABLE 155.—*Medical and nursing care received by mothers of legitimate infants during pregnancy and confinement, by earnings of father; Baltimore, 1915*

Earnings of father	Per cent of mothers having no medical prenatal care	Per cent of mothers having prenatal care of grade A[1]	Per cent of mothers not attended by physician at confinement	Per cent of mothers having 10 or more visits from physician after delivery[2]	Per cent of mothers having no nursing care during confinement period	Per cent of mothers who stayed in bed or in hospital less than 7 days after delivery
Total	47.5	5.1	32.6	15.6	28.6	8.1
Less than $450	53.0	1.3	35.7	8.9	37.2	12.8
$450–$549	58.7	1.8	43.6	8.2	30.1	11.8
$550–$649	59.8	1.6	43.7	9.2	29.9	
$650–$849	52.7	3.5	36.6	14.5	30.4	7.1
$850–$1,049	40.5	6.6	27.9	20.7	26.0	4.2
$1,050–$1,249	30.0	8.2	18.1	24.1	25.0	3.4
$1,250–$1,449	32.9	9.2	19.1	26.9	19.8	2.4
$1,450–$1,849	21.3	16.4	8.5	40.1	15.1	1.7
$1,850 and over	13.8	30.3	6.6	40.3	7.5	
No earnings	41.4	1.7	22.0	8.2	34.9	7.3
Not reported	39.7	4.2	25.1	15.7	31.0	7.3

[1] To qualify as grade A care, the care received by the mother must have satisfied all four of the following requirements: (1) Monthly visits to clinic, or supervision by private physician, from the fifth to the ninth month of pregnancy; (2) monthly urinalysis from the fifth to the ninth month; (3) an abdominal examination; and (4) pelvic measurements (if the mother was a primipara).

[2] Exclusive of mothers with complications of confinement.

The health program recommended by the best medical authorities for pregnant women includes wholesome and nourishing food, at least two hours daily in the open air, and freedom from worry and overwork. This program is obviously one which can be observed more easily and faithfully by women in comfortable circumstances than by women who have to struggle to make ends meet.

When, furthermore, as in many of the families included in this study, the meager earnings of the father have to be supplemented through gainful employment of the mother during pregnancy, the lack of adequate income from father's earnings is primarily responsible for the increased mortality which is found to be associated with the mother's employment during that period. (See discussion, pp. 158–160.)

Specific evidence in regard to the correlation between income and the quality and quantity of care which the baby received during his first year was difficult to secure and was limited to a few points, such as feeding, housing congestion, and the gainful employment of the mother.

A principal element of infant care, maternal nursing during the first nine months, has already been discussed; artificial feeding was less commonly practiced in the lower than in the higher earnings groups. Specific evidence as to the quality of the artificial food used by the several groups unfortunately is lacking. The table already presented (p. 102) indicates, however, that artificial feeding was fraught with greater dangers to the baby's health in the lower-earnings groups. Doubtless such feeding as practised in the families with larger incomes was accompanied by safeguards that were not employed to the same extent in the poorer families. These safeguards probably included the use of pure milk, the practice of proper sterilization of bottles and nipples, the advice of a competent physician in regard to a suitable milk-modification formula and his supervision over the feeding of the baby, and the purchase and correct utilization of the ingredients and medicines prescribed. Each of these safeguards involves the expenditure, if not of money, at least of the mother's time; and therefore their use, other things being equal, would naturally be intimately associated with the income available for the care of the infant.

That differences in the safeguards surrounding the practice of artificial feeding did not fully explain, however, the greater mortality among the infants whose fathers' earnings were comparatively low is shown by the fact that a contrast similar to that between the rates for the artificially fed was found between those for the breast-fed babies in the several earnings groups. Factors explaining the lower mortality among the babies whose fathers had higher earnings doubtless included the greater availability of nursing and medical services during the infant's first year. An additional advantage to the infants in the higher-income groups consisted in the fact that their mothers were freer from household cares, either because of the employment of servants or because of the use of mechanical aids to work, and as a consequence had more time to care for their babies. With larger incomes, moreover, went more satisfactory housing accommodations, as evidenced by the lesser congestion of sleeping and living quarters, and less employment of the mothers away from home. So far as low father's earnings were responsible for housing congestion and for the mother's gainful employment during the first year of the infant's life they were responsible for the greater mortality associated with these factors.

Causes of low father's earnings and of low per capita income.

The causes of low father's earnings and of low per capita income may be indicated in a general way. They depend in part upon the

causes of low wage rates—the oversupply of labor of particular grades and its relative unproductivity, either because of working with insufficient tools or machinery or under antiquated methods, or because of lack of training or of the capacity to acquire skill. They depend also in part upon unemployment and its causes—periodic fluctuations in business; variations in the demand for labor at a particular establishment resulting in temporary expansions or in lay-offs; difficulties incident to the settlement of wage disputes, including strikes and lockouts; and the personal qualities of the individual workman, including qualifications for the job, steadiness at work, and satisfactory or unsatisfactory performance of duties. They depend, furthermore, upon the causes of failure of the father to contribute to the family support other than causes resulting in unemployment, such as his sickness or death or his desertion of the family. Finally, low per capita income, as distinguished from low earnings, depends also upon the size of the family, including the children and other dependents for whose maintenance the bread-winner may be obligated.

Even this partial enumeration of the causes of low income is sufficient to show the complexity of the subject. The solution of the problems involved is a task for the future. Fortunately, however, so far as the relationship between low income and infant mortality is concerned, the fact that the connection is indirect makes possible a method of breaking the chain, namely, making available to all families the elements of care most important for the safeguarding of the health of mother and baby.

Summary.

In the group studied (city births) a marked correlation was found between low earnings of father and high infant mortality. The analysis indicated further that low earnings corresponded to high economic pressure as measured by the per capita income of the family from the father's earnings. The relationship between low earnings and infant mortality was found to be independent of type of feeding, of nationality, and of the factors involved in frequency of births; furthermore, it was largely independent of housing congestion and of the mother's employment, since the same tendency for the rate to fall as the earnings increased was found among the families living in uncongested as among those living in congested quarters and among the families in which the mother was not employed as among those in which the mother was employed away from home.

The responsibility of low income for high infant death rates extended beyond the mortality directly associated with it, covering much of that associated with housing congestion and with the mother's employment.

The study of the chain of causation connecting low income with high mortality showed the direct relation between lack of means and the care available both for the mother during pregnancy and confinement and for the baby during his first year. It suggested, therefore, that if adequate care had been available for the mothers and babies in the low-income groups the high mortality rates of the babies in these groups would not have been found.

APPENDIXES

APPENDIX A.—STILLBIRTHS

In order to eliminate, so far as possible, the influence of variations in the definitions of stillbirths in use in the different States, only cases of at least seven months' gestation were included in this inquiry. In each of the States in which the cities chosen for study were located stillbirths were required by law to be registered, and in each State the legal definition covered cases of at least seven months' gestation.

In studying the question of stillbirth a policy of exclusion was adopted similar to that employed in studying the mortality among live-born infants. The exclusions, therefore, were of five classes: (1) Illegitimate births, (2) births to nonresident mothers, (3) births to mothers who were known to have moved away from the city, (4) births to mothers who had moved away from their addresses as given on the birth certificates and who could not be traced, and (5) births for which the data secured were incomplete or seemed unreliable. The reasons for these exclusions were similar to those given on page 12 for the exclusion of live-born infants of these classes; the securing of a sound basis for stillbirth rates required that the same policy of exclusions be applied to the numerator of the rate fraction as was applied to the denominator.[1]

In all, 813 cases of stillbirth were included in the study, a figure which, when compared with the total number of births, gives a stillbirth rate [2] of 3.4 per cent. Satisfactory comparisons with rates for other areas are difficult, owing to variations in the definition of stillbirth. A tabulation of "stillbirths registered as births" in the greater part of the birth-registration area in 1918 made by the Bureau of the Census indicated a rate of 3.8 per cent. In the census tabulation, however, cases of less than 7 months' gestation were also included, so far as they had been registered as births.[3]

CAUSES OF STILLBIRTH

No satisfactory evidence was available with regard to the specific causes of the stillbirths included in this study. Though spaces for entering the causes of death in such cases were provided on the death certificates, frequently no entry was made; and when entered, the causes as a rule were described in terms so vague that they were practically useless for purposes of analysis. In general, the causes of stillbirth are similar to those of deaths in early infancy and have their origin for the most part in the health and condition of the mother and in the quality of the care that she receives during pregnancy and at confinement.

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[1] See also Appendix B, p. 183, for number of stillbirths excluded.
[2] Stillbirth rates are calculated as percentages of all births, including both live and still births.
[3] Compiled from Birth Statistics, 1918 (U. S. Bureau of the Census), pp. 28–29. The above rate is calculated as a percentage of all births.

PHYSICAL CONDITION OF MOTHER

It has already been mentioned in connection with the analysis of infant mortality that available evidence concerning the mother's physical condition was limited to comparatively few points. These included whether the mother died during the year following confinement, whether she had or had ever had tuberculosis, whether she had convulsions during pregnancy or confinement, and whether she had medical prenatal and confinement care.[4]

Death of mother.

The percentage of stillbirths to mothers who died during the year following confinement was 18.6, over five times as high as that of such births to all other mothers (3.3). The rate was especially high (32.5 per cent) for births to mothers who died within the following month—almost all from causes directly connected with pregnancy or confinement. In these cases probably the same causes that led to the death of the mother were responsible for the death of the infant at or before birth. For births to mothers who died after the first month but during the year following confinement, the rate (based on comparatively few cases) was 6 per cent, or nearly twice that for births to mothers who survived the year.

In this connection it is of interest to note that the stillbirth rate for infants who were prematurely born to mothers who died (26.3 per cent) was only slightly higher than that for other premature births (22.1 per cent). On the other hand, the stillbirth rate for infants born at term to mothers who died (15.9 per cent) was over seven times as high as that for full-term births to mothers who survived the year (2.1 per cent). (Compare General Tables 4 and 7, pp. 188 and 189.)

Tuberculosis of mother.

The number of cases of stillbirths to mothers who had or had ever had tuberculosis was too small to show any influence of this condition upon the rate. Of 99 babies of such mothers 3 were born dead, as compared with 3.56 stillbirths at the rate for all other births.

Convulsions.

Of 53 cases in which mothers had convulsions as a complication of pregnancy or confinement 11 resulted in stillbirths. The figure representing stillbirths expected in this group at the rate for all other births was 1.84. In other words, the stillbirth rate for the babies of mothers who had convulsions was nearly six times that for other infants.

Medical prenatal care.

The fact already pointed out as making difficult any conclusion in regard to the relation between prenatal care and infant mortality was strikingly illustrated by the stillbirth rate of mothers who had had such care; namely, the greater tendency of mothers who were in poor health than of those who were well to seek medical care during pregnancy. The results of this tendency were shown clearly in the fact that the stillbirth rate for cases in which the mothers had medical prenatal care was 4.1 per cent, as compared with only 2.9 per cent for those in which the mothers had no such care.

[4] The data on all these points except the death of the mother were limited to one city, Baltimore.

FREQUENCY OF BIRTH

Age of mother.

The stillbirth rates, as Table 156 shows, varied with the age of the mother, being relatively high for the babies both of mothers under 20 and of those 40 years of age and over. For the infants of mothers who were under 18 the rate was 5.2 per cent, only slightly less than that (5.6 per cent) for those of mothers who were 40 and over. When the stillbirths in the age group "40 and over" were analyzed, it was found that the rate for ages 40 to 44 was only 5.1 per cent and that for ages 45 and over (based on very few cases) was more than three times as high (15.4 per cent). The lowest proportion of stillbirths was found in the group of births to mothers who were 20 to 24 years of age.

TABLE 156.—*Stillbirth rates, by age of mother; births in eight cities*

Age of mother	Births	Stillbirths		Age of mother	Births	Stillbirths	
		Number	Per cent			Number	Per cent
Total	23,780	813	3.4	30–34	4,389	158	3.6
				35–39	2,815	127	4.5
Under 20	1,660	76	4.6	40 and over	1,015	57	5.6
Under 18	362	19	5.2	40–44	963	49	5.1
18–19	1,298	57	4.4	45 and over	52	8	15.4
20–24	7,070	191	2.7	Not reported	9	----	----
25–29	6,822	204	3.0				

Order of birth.

In Table 157 the variations in the stillbirth rates are shown by order of birth. The rate was much higher for first than for second infants (4 as compared with 2.5 per cent); it rose steadily with the increase in order up to seventh, fell off slightly for eighth and ninth, but rose to the highest point of all (5.5 per cent) for tenth and later births. This trend of the stillbirth rates was similar to that of the mortality rates from causes peculiar to early infancy, discussed on pages 16–18.

TABLE 157.—*Stillbirth rates, by order of birth; births in eight cities*

Order of birth	Births	Stillbirths		Order of birth	Births	Stillbirths	
		Number	Per cent			Number	Per cent
Total	23,780	813	3.4	Fifth	1,830	63	3.4
				Sixth	1,310	47	3.6
First	6,491	261	4.0	Seventh	968	47	4.9
Second	5,080	126	2.5	Eighth	707	30	4.2
Third	3,423	95	2.8	Ninth	489	19	3.9
Fourth	2,555	74	2.9	Tenth and later	927	51	5.5

Interval since preceding birth.

The variations in the stillbirth rates (Baltimore only) by interval since the preceding birth, as measured by the difference in even years between the mother's ages at successive confinements, are shown in Table 158. The rate was markedly higher for the short-interval babies—those born to mothers who were only one year older at the

time of the birth of the scheduled infant than at the time of the next preceding birth—than for the babies of mothers who were two or three years older, the rates being 3.6, 3.1, and 2.4 per cent, respectively. But the rate was even higher (3.9 per cent) for births to mothers who were four years or more older than at the time of the next preceding confinement. For none of these groups, however, was the rate so high as for first infants.

TABLE 158.—*Stillbirth rates, by interval since preceding birth;*[1] *births in Baltimore*

Interval since preceding birth[1]	Births	Stillbirths	
		Number	Per cent
Total	11,195	398	3.6
First birth	2,999	131	4.4
Second and later births	8,196	267	3.3
One year	2,149	77	3.6
Two years	3,045	95	3.1
Three years	1,398	34	2.4
Four years and over	1,556	60	3.9
Not reported	48	1	2.1

[1] For definition of interval see p. 60.

TYPE OF BIRTH

Prematurity.

Of the 813 stillbirths included in the study about three-fifths (59.3 per cent) were full term and two-fifths (40.7 per cent) premature. Of the premature the proportion born dead was 11 times as high as of the infants born at term, the percentages being 24.6 for premature births and 2.2 per cent for full-term births. (See General Table 4, p. 188.) If data were available for classification by the exact period of gestation, the rates would doubtless show a rapid decline in the percentages of stillbirths as the periods of gestation increased.

Plural births.

The proportion of stillbirths was much higher for the plural than for the single births—5 per cent as compared with 3.4 per cent. In the group of full-term single infants the proportion of stillbirths was only 2.1 per cent, but in that of full-term twins and triplets it reached 3.8 per cent. The relative rates were reversed, however, for the prematurely born, the higher rate (25.8 per cent) being found for the single and the lower (11.1 per cent) for the plural. (See General Table 46, p. 204.)

Type of delivery.

The proportion of stillbirths among the cases of instrumental delivery (which included about 1 in every 15 births) was very high—12.2 per cent, or over four times the percentage of stillbirths among normal deliveries, 2.8. In fact, 104 stillbirths were delivered with the aid of instruments as compared with only 23.8 which would have been expected if the rate for normal deliveries had prevailed.[5]

One of the 16 cases in which the mother was delivered by Cæsarean section resulted in a stillbirth.[5]

[5] The data on these points were for Baltimore only.

SEX

A larger proportion of the stillborn than of the live-born infants were of the male sex—54.1 as compared with 50.8 per cent. The stillbirth rate for the male was higher than that for the female infants; 3.6 per cent of the former as compared with 3.2 per cent of the latter were born dead. The causes of the slightly greater tendency toward stillbirth among the males are doubtless associated with the somewhat greater average size of the male infant, which results in more difficult labor. This hypothesis is supported by the fact that in the group of male infants born at term the percentage of stillbirths was 2.4, or one-fifth higher than that (1.9) in the group of female infants born at term, whereas for the males who were born prematurely the proportion of stillbirths was not so large as that for the females. (See General Table 4, p. 188.)

COLOR AND NATIONALITY OF MOTHER

In Table 159 stillbirth rates are given for each color and nationality group. The most striking fact shown was the extremely high rate (8 per cent) for births to colored mothers, which was twice as high as the highest rate for births to mothers of any other color or nationality group. For a plausible explanation of this unusually high rate reference may be made to the great prevalence of syphilis which Dr. Whitridge Williams found among negro women confined in hospitals in Baltimore, the city in which the great majority of the negro mothers included in the study lived.[6] Another possible cause is the greater prevalence of rachitic pelves among negro mothers.

As for the other color and nationality groups, the exceptionally low stillbirth rates for infants born to Jewish and to Portuguese mothers were noteworthy. These low rates corresponded to low mortality from causes peculiar to early infancy, and in the case of the Jewish group to low mortality in the first month; among the babies of Portuguese mothers the mortality in the first month was increased by many deaths charged to gastric and intestinal diseases (p. 105). The French-Canadian group had an unusually high proportion of stillbirths (4 per cent), and the percentage for the Italian group was also high (3.6). The rate for the native white group was third from the lowest, being higher only than the rates for births to Jewish and to Portuguese mothers.

[6] "It has long been known that this disease (syphilis) plays an important part in the causation of fetal deaths." Williams, J. Whitridge, M. D.: The Limitations and Possibilities of Prenatal Care; based upon the study of 705 fetal deaths occurring in 10,000 consecutive admissions to the obstetrical department of the Johns Hopkins Hospital, p. 35. American Association for Study and Prevention of Infant Mortality, Boston, 1914.

TABLE 159.—*Stillbirth rates, by color and nationality of mother; births in eight cities*

Color and nationality of mother	Births	Stillbirths	
		Number	Per cent [1]
Total	23,780	813	3.4
White	22,196	686	3.1
Native	12,475	373	3.0
Foreign born	9,721	313	3.2
Italian	1,480	54	3.6
Jewish	1,267	34	2.7
French-Canadian	1,119	45	4.0
German	803	27	3.4
Polish	1,306	40	3.1
Portuguese	687	18	2.6
Other	3,056	94	3.1
Not reported	3	1	
Colored	1,584	127	8.0

[1] Not shown where base is less than 100.

EMPLOYMENT OF MOTHERS DURING PREGNANCY

The employment of mothers during pregnancy, as Table 160 shows, appeared to exert a marked influence over the occurrence of stillbirths. The rate for births to mothers who were employed away from home during pregnancy was 4.9 per cent, or over one and one-half times that found for births to mothers who were not gainfully employed (3.1 per cent). The rate for births to mothers employed at home was 3.5 per cent. These variations were similar to those found in the mortality rates for these groups from causes peculiar to early infancy (p. 132).

TABLE 160.—*Stillbirth rates, by employment of mother during pregnancy; births in eight cities*

Employment of mother during pregnancy	Births	Stillbirths	
		Number	Per cent [1]
Total	23,780	813	3.4
Employed away from home	3,244	160	4.9
Employed at home	3,926	138	3.5
Not employed	16,603	514	3.1
Not reported	7	1	

[1] Not shown where base is less than 100.

EARNINGS OF FATHER

Table 161 indicates that the stillbirth rates varied with the amounts of father's earnings, falling as the earnings increased and rising as they decreased. The highest stillbirth rate (6.8 per cent) was found in the "no earnings" group and the lowest (2.2 per cent) in the group "$1,050–$1,249," though the group "$1,250 and over" had nearly as low a rate (2.7 per cent). The groups "under $450" and "$450–$549" had rates markedly above average—4 and 4.1 per cent, respectively.

TABLE 161.—*Stillbirth rates, by earnings of father; births in seven cities*

Earnings of father	Births	Stillbirths		Earnings of father	Births	Stillbirths	
		Number	Per cent			Number	Per cent
Total	22,281	745	3.3	$850–$1,049	3,445	100	2.9
				$1,050–$1,249	1,423	32	2.2
Less than $450	3,214	129	4.0	$1,250 and over	2,315	63	2.7
$450–$549	2,947	120	4.1	No earnings	336	23	6.8
$550–$649	3,014	106	3.5	Not reported	380	15	3.9
$650–849	5,207	157	3.0				

SUMMARY

The causal factors which appeared to have exerted the greatest influence over the stillbirth rates were those connected with the mother's health and those connected with the type of birth. The contrast between the stillbirth rate for the babies of mothers who died during the month following confinement and that for the babies of mothers who survived the year was especially marked, the rates being 32.5 per cent and 3.3 per cent, respectively. Likewise marked was the contrast between the proportions of infants born dead among the premature and among those born at term—24.6 per cent and 2.2 per cent, respectively.

Other factors that exerted an influence over the frequency of stillbirths included age of mother, which showed itself in high rates for the infants of the youngest and the oldest mothers; order of birth, which showed itself in high rates for first babies and for births of late orders; and interval since preceding birth, which showed itself in a high percentage of stillbirths for the group of babies born after short intervals. The stillbirth rate was higher for male than for female infants. Among the colored the frequency of stillbirths was much higher than in any other race or nationality group; the lowest frequencies were found for the babies of Jewish and Portuguese mothers. The proportion of infants born dead was much higher among those born to mothers who were employed away from home during pregnancy than among those born to other mothers. Relatively high stillbirth rates were found in families in which the father's earnings were low.

APPENDIX B.—METHOD OF STUDY [1]

The object of the studies on which this report is based, was to show the causes of infant mortality and its relation to various social, economic, and physical conditions. For this purpose it was essential to secure accurate mortality rates, not only for the group as a whole, but also for each of the subgroups the proportions of deaths in which were to be compared. It was not essential, however, that all the births in each city studied should be included, provided that accurate mortality rates could be obtained for those selected and that those selected constituted fairly representative samples.

INFANT MORTALITY RATE

In order to secure an accurate mortality rate for the births selected the procedure was adopted of following each infant from the date of birth until he reached his first birthday, or until his death if he died under the age of 1 year. The ratios of deaths to births as thus computed are true "probabilities of dying" and are independent of variations in the birth rate, a factor which may introduce inaccuracies into infant mortality rates as commonly calculated by dividing the births that occur during a given year into the infant deaths during the same period.

EXCLUSIONS

In order not to introduce unnecessary and unknown errors of sampling into the data all the live births that occurred within given years in the cities selected for study, with certain definite exceptions, were included. The exceptions fell into five well-defined groups: (1) Illegitimate births, (2) births to nonresident mothers, (3) births to mothers who were known to have moved away from the city, (4) births to mothers who had moved away from the addresses given on the birth or death certificates and could not be traced, and (5) births for which the information was incomplete or appeared unreliable. The reasons for these exclusions were intimately connected not only with the problems involved in locating and interviewing the mothers but also with those involved in the accurate computation of an infant mortality rate.

Illegitimate births were excluded partly because it was more difficult to secure for them accurate and reliable data and partly because the items of information that could be obtained would have required a special analysis separate from that for the legitimate births. An attempt to secure such information was made in Baltimore, and the results were presented in a special section of the report dealing with that city.[2]

[1] See also the appendixes to the separate studies of infant mortality made by the Children's Bureau and "Infant-mortality studies of the Children's Bureau," by Robert M. Woodbury, in Quarterly Publications of the American Statistical Association for June, 1918, Vol. XVI, pp. 30–53.

[2] Infant Mortality—Results of a Field Study in Baltimore, Md., based on births in one year, by Anna Rochester, pp. 155–176. U. S. Children's Bureau Publication No. 119, Washington, 1923.

Births to nonresident mothers were excluded partly because of the difficulty and expense of locating and visiting such mothers after they had returned to their homes but also partly because the conditions surrounding these infants might not be typical of those in the city which was being studied. Especially would this latter be true of the maternity cases sent from outlying districts to the city hospitals on account of some expected complication of confinement.

Births to mothers who were known to have moved away from the city, like those to nonresident mothers, were excluded in part because of the difficulty and expense of locating and visiting the mothers to secure the necessary information and in part because the circumstances surrounding the infants after removal from the city would not have been typical of the city. A still more serious objection to including these births, however, was that in many cases it would have been impossible to secure records even of deaths which had occurred among the infants in this group after the families had moved. Accurate statements of the ages at which the infants left the city, furthermore, could not have been obtained without finding and interviewing every mother.

Births to mothers who had removed from their addresses in the city as given on the birth certificates and who could not be traced were necessarily excluded. In the great majority of cases, doubtless, they had moved away from the city without leaving with their former neighbors any information as to their new addresses.

These groups of migratory families would furnish an interesting study, if data were available, since the mortality rate for their infants might be affected by shifting from one place to another. But the difficulties in the way of obtaining the necessary information for the present series of reports were such that no special study could be made. The data that were secured in regard to such excluded cases yield only a minimum statement of the mortality that prevailed among the infants in these families.

Finally, a small number of infants were omitted because the data secured for them were fragmentary or obviously unreliable.

With these five groups of infants excluded, the problem remained of securing a complete account of all the other infants born in the selected year or of selecting for study a group for which accurate mortality rates could be secured. With two exceptions, Akron and Baltimore, all the cities studied were in the United States provisional birth-registration area and could therefore be presumed to have fairly complete birth registration. In the progress of the work, however, a number of death certificates were discovered for infants for whom no birth certificates were on file, and in some of these cases it was definitely ascertained that the infants had been born in the city and in the year selected for study. To include these infants who died without making an effort to locate unregistered infants who survived the year, however, would have resulted in a bias in the mortality rates. Accordingly, in three cities, Manchester, New Bedford, and Brockton, the studies were limited to infants whose births were registered. It should be noted, however, that in New Bedford and Brockton special house-to-house canvasses had been made by the State as part of the routine of checking birth registration; in these cities, therefore, birth registration was exceptionally complete.

In other cities more or less comprehensive efforts were made to supplement birth-registration lists, and all births in the year and in the area selected for study were included except those belonging to the excluded groups. In Johnstown, registration was found to have been defective in the Serbian neighborhoods, and many births were added by consulting the registers of baptisms in the Serbian churches and by inquiring at each home visited in the Serbian quarter of the city as to whether other children had been born in the neighborhood during the year selected for study.[3] These births, added to those which had been registered, formed the basis of the study. In Saginaw many births were added to the list as a result of extended neighborhood inquiries, consultations of baptismal registers, and other measures.[4] In Waterbury the list of registered births was supplemented with others found in the course of a house-to-house canvass and an examination of church registers of baptisms and of the records of social agencies and institutions.[5] In Akron, a city not in the birth-registration area, a house-to-house canvass was made, and the results were compared with the list of registered births and with the records of baptisms.[6] In Baltimore a vigorous campaign for improved registration was in progress during the year selected for study. (Maryland was admitted to the birth-registration area in the following year.) Though during the progress of the inquiries made by the Children's Bureau in that city many infants whose births had not been registered were discovered, all such cases were reported to the health department; and this department, after obtaining the information asked for on the birth certificates, registered the births. In Baltimore, therefore, every case located became, if it was not already, a registered birth.[7]

The efforts made to locate unregistered births may have failed to complete the lists of those that fulfilled the requirements for inclusion in the studies, and to the extent that such births were omitted an element of selection may have made the results not exactly typical of the cities studied. A difficulty, however, that arises in connection with a failure to locate unregistered births is the fact that, because death registration is usually more complete than birth registration, infants whose births were unregistered were more easily learned of and therefore more likely to have been included in the study if they died than if they lived, since if they died their deaths would have been recorded. The omission of any considerable number of unregistered births, therefore, except in those cities in which only registered births were included, would have meant a tendency toward an overstatement of the mortality rate, especially for those groups, if any, in which omissions were numerous.[8] The point should be emphasized, however, that the results could not have been influenced by omissions of unregistered illegitimate births, of

[3] Infant Mortality—Results of a Field Study in Johnstown, Pa., based on births in one calendar year, by Emma Duke, p. 13. U. S. Children's Bureau Publication No. 9. Washington, 1915.

[4] Infant Mortality—Results of a Field Study in Saginaw, Mich., based on births in one year, by Nila F. Allen, pp. 11, 68 ff. U. S. Children's Bureau Publication No. 52. Washington, 1919.

[5] Infant Mortality—Results of a Field Study in Waterbury, Conn., based on births in one year, by Estelle B. Hunter, pp. 20 ff. U. S. Children's Bureau Publication No. 29. Washington, 1918.

[6] Infant Mortality—Results of a Field Study in Akron, Ohio, based on births in one year, by Theresa S. Haley, pp. 76 ff. U. S. Children's Bureau Publication No. 72. Washington, 1920.

[7] Infant Mortality—Results of a Field Study in Baltimore, Md., based on births in one year, by Anna Rochester, pp. 185 ff. U. S. Children's Bureau Publication No. 119. Washington, 1923.

[8] In Baltimore, where births were registered as soon as they were located or where infants whose births were unregistered were looked up immediately and registered if records of their deaths were filed, any omission of unregistered births would likewise have affected the mortality rates.

births to nonresidents, or of births in families that moved away from the city, since all births of these classes were excluded. Only the omission of unregistered legitimate infants of resident mothers, born in the selected year in the area studied, who were still living in the area at the time the visits of agents were made or who had died at ages under 1 year before that time, would have affected the conclusions. But these infants were the easiest to locate by means of neighborhood inquiries or of a house-to-house canvass. Where such inquiries were thorough or where such a canvass was made the chance of important omissions was relatively slight.

In the nature of the case it is extremely difficult to assess the importance of such omissions. In Akron detailed records of the results of the canvass permit the testing of its completeness. It should have produced a report for each infant born in the selected year and living in Akron at the time the canvass was made. Of those whose births were registered and who survived the first year of life—except children who were temporarily absent, who had moved away from the city, or who had died at ages over 1 year—the canvass should have found practically all. It failed to find 7.6 per cent of them and may therefore be regarded as 92.4 per cent perfect. The number of unregistered births discovered through the canvass and by other means formed 13.7 per cent of the total, which showed that registration in Akron was not more than 86.3 per cent perfect. The chance, therefore, that a case would not be located by either of these methods was very small. The two methods of locating births, used independently for the same purpose, would have located, according to the mathematics of probability, approximately 99 per cent of all cases that fulfilled the requirements for inclusion in the study. For other cities, unfortunately, material is not available for similar computations.

INFANT MORTALITY RATES IN EXCLUDED GROUPS

On account of differences in detail between the methods followed in the several cities the cities were divided into three groups: First, those in which only the registered births were considered for inclusion in the study, comprising Manchester, Brockton, and New Bedford; second, those in which all births located were considered for inclusion and in which information was available as to whether or not each birth had already been registered, comprising Johnstown, Saginaw, Waterbury, and Akron; and, finally, Baltimore, in which all births located were considered for inclusion but at the same time were placed on the register if not previously recorded, so that, in fact, all the births included were registered.

Group I.

In the cities included in Group I—Manchester, Brockton, and New Bedford—in which the births studied were limited to those which had been recorded, according to Table 162, a total of 7,053 births were found to have been registered; of these the information obtained in regard to 5,361 satisfied all the conditions for inclusion, and that obtained in regard to 1,692 failed to satisfy one or more of the conditions.

The mortality rate for the group of 70 births which were excluded solely on the ground of illegitimacy was 314. This group, it should be borne in mind, did not include all the illegitimate births but only those which did not fall into one of the other groups of exclusions.

The nonresident group of registered births, which numbered 134, had a mortality rate somewhere above 74.6. This figure is based upon the infants whose births were registered and the deaths among them before they were taken away from the city, and is obviously an understatement. The deaths enumerated for this group doubtless included most if not all of those that occurred during the first two weeks of life and included a certain proportion of those that occurred later, depending on the average age of the infants when they were taken away.

The group of babies whose families had moved away from the city numbered 719 and had a mortality rate of over 157.2. For reasons similar to those given for the nonresidents this figure also must be considered an understatement, since deaths after these infants had left the city were not included in the computation. Since, however, the average age when taken away from the city must have been higher for these infants than for the nonresident infants, more of the deaths that occurred among the former doubtless were included—a fact which accounts, in part at least, for their higher minimum mortality rate.

TABLE 162.—*Infant mortality rates for excluded groups, by reason for exclusion and registration of births; births in Manchester, Brockton, and New Bedford*

Inclusion and exclusion, and reason for exclusion	Live births			Infant deaths			Infant mortality rates [1]		
	Total	Registered	Unregistered	Total	Births registered	Births unregistered	Total	Births registered	Births unregistered
Total	7,203	7,053	150	1,089	1,001	88	151.2	141.9	586.7
Included	5,361	5,361	-------	712	712	-------	132.8	132.8	-------
Excluded	1,842	1,692	150	377	289	88	204.7	170.8	586.7
Nonresidence and lack of information	1,630	1,622	8	272	267	5	166.9	164.6	-------
Not found	737	733	4	131	127	4	177.7	173.3	-------
Data incomplete and unreliable	36	36	-------	17	17	-------	-------	-------	-------
Nonresident	137	134	3	10	10	-------	73.0	74.6	-------
Removed	720	719	1	114	113	1	158.3	157.2	-------
Illegitimacy [2]	70	70	-------	22	22	-------	-------	-------	-------
Nonregistration of birth	142	-------	142	83	-------	83	584.5	-------	584.5

[1] Not shown where base is less than 100.
[2] Including only births in the resident and located groups.

The group of infants whose births were registered but who were not found had an even higher known rate (173.3); and since the presumption is that in most of these cases also the families had moved away from the city, some deaths probably occurred among these infants in addition to those represented in this figure. Since, however, in the cities in Group I no house-to-house canvasses nor systematic neighborhood inquiries were undertaken, this group may have included many infants in families difficult to locate merely because they had moved from one address to another in the same city. If so, the rate is only slightly understated.

Of the 36 infants whose births were registered but for whom such data as were obtained were incomplete or seemed unreliable nearly half had died under 1 year of age. This extremely high proportion of deaths was undoubtedly due to the fact that difficulty in securing accurate and complete information was encountered more often in cases in which the infants had died than in those in which they were still living, and more often in cases in which the mothers or both parents had died or deserted—groups in which the mortality rates would be expected to be high—than in those in which the family conditions were normal.

Since in the cities of Group I no effort was made to discover unregistered births other than those discovered through the death certificates or through some more or less accidental source of information, the number of unregistered births shown is considerably smaller than the true number. The rate of 584.5 for the group of births excluded because not registered is, therefore, no indication of the true mortality in this group.

The numbers of unregistered births excluded because "not found," "removed," or "nonresident" were too small to afford a satisfactory basis for calculating rates; furthermore, for these groups also the figures are meaningless, since no effort was made to ascertain the true number of births.

Group II.

In the cities included in Group II—Johnstown, Saginaw, Waterbury, and Akron—in which special efforts were made to supplement the lists of registered births, according to Table 163, a total of 8,493 births were known to have occurred, of which 6,809 satisfied all the conditions for inclusion and 1,684 were excluded because the information obtained failed to meet one or more of these conditions.

The 82 infants excluded solely on the ground of illegitimacy had a mortality rate of 256. As in the cities of Group I, however, only those illegitimate births which did not fall in one of the other exclusion groups were here included. The number, therefore, fails to show the true extent of illegitimacy in these cities. Nevertheless this mortality rate is probably approximately accurate for the resident and located illegitimate infants.

In these cities the births to nonresident mothers numbered only 98. The mortality among such infants whose births were registered was more than 69; for reasons stated in discussing births of this class in the cities of Group I the known deaths give a rate which is obviously an understatement. Of the 11 infants born to nonresident mothers, whose births were not registered, 5 died under 1 year of age. This mortality proportion, however, is not significant, since the number of births appearing in the group is far below the true number, which the methods of canvassing and of neighborhood inquiry were not adapted to ascertain.

TABLE 163.—*Infant mortality rates in excluded groups, by reason for exclusion and by registration of births; births in Akron, Waterbury, Saginaw, and Johnstown* [1]

Inclusion and exclusion, and reason for exclusion	Live births			Infant deaths			Infant mortality rates [2]		
	Total	Registered	Unregistered	Total	Births registered	Births unregistered	Total	Births registered	Births unregistered
Total	8,493	7,509	984	928	720	208	109.3	95.9	211.4
Included	6,809	6,011	798	726	578	148	106.6	96.2	185.5
Excluded	1,684	1,498	186	202	142	60	120.0	94.8	322.6
Nonresidence and lack of information	1,602	1,426	176	181	122	59	113.0	85.6	335.2
Not found	390	295	95	48	26	22	123.1	88.1	
Data incomplete and unreliable	11	9	2	6	5	1			
Nonresident	98	87	11	11	6	5			
Removed	1,103	1,035	68	116	85	31	105.2	82.1	
Illegitimacy	82	72	10	21	20	1			

[1] In these cities nonregistration of birth was not a reason for exclusion.
[2] Not shown where base is less than 100.

The registered births to mothers who moved away from the city numbered 1,035, and for this group an infant mortality rate of 82.1 was found. This figure also, for reasons previously explained, was an understatement on account of the omission of deaths after infants had been taken away from the city. The unregistered births to mothers who moved away were obviously not completely reported, and therefore the proportion of deaths in this group is not significant.

The registered births to mothers who were not located numbered 295, and the known mortality among these infants was 88.1, probably an understatement. The corresponding figures for the unregistered births to such mothers are not significant.

A small number of cases (11) were excluded because the data obtained were incomplete or seemed unreliable. Six of these infants died under 1 year of age.

Group III.

In the one city in Group III, Baltimore, as in Group II, nonregistration of births was not a reason for exclusion. Mortality rates could not be figured separately, however, for the births in Baltimore that were not registered prior to the time of the study but were figured for all registered births including those newly found. The rates for all the births should therefore be compared with those for the corresponding totals in Group II. Another important difference between these figures and those for Group II is that in Baltimore all the births that were ascertained to have been illegitimate were classified as excluded on the ground of illegitimacy, whereas in other cities they were classified as excluded on that ground only in case they would otherwise have been included. This difference, however, is to some extent offset by the fact that in Baltimore efforts were made to ascertain whether an illegitimate infant died after being taken away from the city, and if he was found to have died his death was counted in computing mortality rates for the illegitimate infants; whereas in other cities no effort was made to follow infants after they had left the city and only deaths within the city were counted in computing rates.

TABLE 164.—*Infant mortality rates for excluded groups; Baltimore* [1]

Inclusion or exclusion, and reason for exclusion	Live births	Infant deaths	Infant mortality rates
Total	13,477	1,551	115.1
Included	10,797	1,117	103.5
Excluded	2,680	434	161.9
Nonresidence and lack of information	1,725	153	88.7
Not found	284	40	140.8
Data incomplete and unreliable	23	11	478.3
Nonresident	338	29	85.8
Removed	1,080	73	67.6
Illegitimacy	955	281	294.2

[1] Although in the present discussion the illegitimate groups are classed as excluded, detailed data were secured for a considerable proportion of them and formed the basis for a special section in the report on infant mortality in Baltimore. See Infant Mortality—Results of a Field Study in Baltimore, Md., based on births in one year, by Anna Rochester, pp. 155–176 (U. S. Children's Bureau Publication No. 119, Washington, 1923).

The mortality rate for the illegitimate infants, based upon all births and the known deaths of such infants, was 294.2. This rate constitutes an understatement, for the deaths included only those which were registered in Baltimore or which, though they occurred after the babies had left the city, were discovered during the course of the study. A considerable number of the infants in this group—256, or 27 per cent—could not be traced. The deaths omitted from the record, assuming fairly complete death registration in Baltimore, must have been those which occurred after the infants had left the city and which were not traced, and the proportion of omitted deaths must have corresponded roughly, therefore, to that proportion of the time lived by all the illegitimate infants during their first year of life that was lived by such infants after they had been taken away from Baltimore. But without evidence as to their average age at the time of removal or even positive evidence that they left the city when under 1 year of age, it is impossible to estimate the true mortality rate for the illegitimate babies who could not be traced.

The nonresident and the removed groups appear to have had mortality rates markedly below the average for the city—85.8 and 67.6, respectively. These low rates, however, obviously understate the true mortality among these groups, since they were based only on deaths that took place in the city and additional deaths may have occurred after the infants were taken out of the city. The rate of 140.8 for the "not found" group is affected by another type of error: Infants who died in the city were almost certain to be registered, whereas those who lived and had not been registered at the time of birth were often, probably, not discovered in the course of the efforts made to locate unregistered births (in many cases the families had left the city before inquiries were commenced) and hence were never in the group at all. In other words the group includes too many deaths in proportion to its births.

The group of cases omitted because of incompleteness or unreliability of data, also, was doubtless biassed by the tendency to include

a disproportionate number of infants who died. The number of cases, too, was small. The rate for this group, therefore, is probably not significant.

For the entire group of infants excluded because of nonresidence or lack of information the mortality rate (88.7) is affected by two opposite and to a certain extent counteracting tendencies—the tendency to omit deaths because of the removal of the infants from the city when they were less than 1 year old and the tendency to omit births that would have been more easily discovered if all infants born in the city in the given year had lived there until the study was completed.

SUMMARY

Exclusion of certain groups was found necessary not only because detailed information was lacking in certain cases but also in order to eliminate groups in which it was difficult or impossible to calculate valid mortality rates. The analysis shows that the rates found for the excluded groups were understatements, approximately correct or entirely without significance, depending upon the reason for exclusion and the method of study adopted. No general or combined result for the excluded groups is of significance, therefore, since the particular characteristics of the separate groups which affect the interpretation of the rates are lost sight of in the process of combining the results.

The same policy of exclusion was adopted for stillbirths as for live births, in order that the rates obtained by dividing the number of infants born dead by the sum of those born alive and those born dead might be on a sound basis. In addition, all miscarriages (births of less than seven months' gestation) were excluded.[9]

A special reason for the exclusion of stillbirths to nonresident mothers was the possibility of overweighting with complicated cases in which, because of their unusual difficulties, the special facilities of the maternity hospitals of the cities had been sought. Likewise excluded were stillbirths to mothers who had moved away prior to the visit of the agent and to mothers who could not be located. In these cases it would have been difficult to obtain the information, and, furthermore, since the corresponding live births were omitted, the exclusion of the stillbirths was necessary in order to compute a fair rate. In many of these cases, moreover, it was impossible to determine whether the case was a stillbirth or a miscarriage, since the period of gestation could not be learned.

No stillbirth rates can be calculated for the various excluded groups because of the uncertainty (just mentioned) as to the period of gestation of the excluded cases. The numbers of stillbirths excluded for the various reasons are given in Table 165.

[9] In Baltimore miscarriages of more than 4 months' gestation were required to be registered; in the report for Baltimore, accordingly, these were included in the discussion. For the present report, however, in which the results for all the cities are combined, dead births of less than 7 months' gestation were uniformly excluded.

TABLE 165.—*Stillbirths and miscarriages included in and excluded from detailed analysis, by reason for exclusion; eight cities*

Inclusion or exclusion and reason for exclusion	Stillbirths and miscarriages
Total known stillbirths and miscarriages	1,874
Stillbirths included	813
Miscarriages and stillbirths excluded	1,061
Miscarriages	645
Stillbirths [1]	416
Nonresidence and lack of information	260
Not found	94
Data incomplete or unreliable	7
Nonresident	49
Removed	110
Illegitimacy	117
Foundlings [2]	22
Nonregistration of birth	17

[1] May include some miscarriages. In many cases of the "not found," "nonresident," "removed," and "foundling" groups the period of gestation could not be learned.
[2] No report as to legitimacy.

APPENDIX C.—METHOD OF ANALYSIS

In dealing with a subject in which so many causes are at work as in infant mortality, some method of separating the influence of a single cause from that of others is essential. In the present report, recourse has been had to the method of expected deaths developed and applied to the study of infant mortality by Prof. Harald Westergaard, of the University of Copenhagen.[1]

The principle involved in this method is simple. Suppose it is desired to show the influence of type of feeding upon infant mortality, regardless of differences in months of age. First, the mortality rates for breast-fed infants in each month of life are ascertained, and second, the numbers of infants artificially fed in the corresponding months are multiplied by these rates in order to determine the number of deaths that would have occurred among the artificially fed provided the rates found for the breast fed had prevailed. The ratio between the number of expected deaths as thus computed and the number of actual deaths is a measure of the relative mortality among the artificially-fed as compared with that among the breast-fed infants uninfluenced by the differences in the ages at which the two types of feeding were given.

An alternative procedure which leads to the same general result is to use the average death rates in each month instead of the rates for breast-fed infants only. In this procedure the actual deaths among the artificially fed are compared with the number expected if the average mortality had prevailed among them, and the result gives the mortality among the artificially fed as compared with the average mortality after differences in the ages at which artificial feeding was given have been taken into account. The actual deaths among the breast fed can be similarly compared with the number expected if average rates had prevailed; and this comparison shows the advantage which the breast-fed infants had after taking into account the ages at which breast feeding was given. A comparison of the mortality among the artificially fed with that among the breast fed can then be made, since the ratio for each group is a comparison with the average.

To take a second illustration, suppose it is sought to determine whether the mortality among infants of mothers who were employed during pregnancy exceeds that among infants of mothers who were not employed. Suppose further that the obvious classification of infants into two groups, those whose mothers were and those whose mothers were not employed, yields mortality rates that show a greater mortality among the former. This result may be due to the fact

[1] For an example of this method, see Die Lehre von der Mortalität und Morbilität, by H. Westergaard, pp. 336-338 (Second Edition, 1902). See also "Westergaard's method of expected deaths as applied to the study of infant mortality," by Robert M. Woodbury, in Quarterly Publications of the American Statistical Association, Vol. XVIII, pp. 366-376.

that the group of infants whose mothers were employed had more than its due proportion of babies of certain nationalities for which the death rates were unusually high. The next step is, therefore, to divide the infants in each nationality into two groups, those whose mothers were and those whose mothers were not employed, and to compare the mortality in each of these groups for each nationality. The question may then arise as to whether the relative mortality in the two employment groups was not affected by a disproportionate weighting of one with infants whose fathers' earnings were low. If such a disproportionate weighting is found, the process of subdivision is carried further; the births are classified according to both nationality of mother and father's earnings, in each of these groups the mortality among babies of employed mothers is compared with that among babies of mothers who were not employed, and finally a conclusion is reached as to the effect, if any, of the mother's employment upon infant mortality.

In this process of subdivision, the number of groups to be compared is continually increased until it becomes difficult for the mind to grasp the conclusions. Evidently some method of summarizing the comparisons of the several groups is necessary; but if the births and deaths in each group are merely added together, the process gives only the figures from which the analysis originally proceeded. The method of summation should produce conclusions independent of the differences in distribution that complicated the original findings. The obvious method is to combine the evidence which the different groups present on the question of the relative mortality of the babies of employed mothers, which is done by the simple expedient of calculating the expected deaths in each group—the deaths expected at the rate found for the babies of nonemployed mothers or, if preferred, the deaths expected at the average rate for all babies in the group. By adding together on the one hand all the actual and on the other all the expected deaths the validity of the comparisons between the several groups is kept and the evidence is summarized. The final result is then in the form of a comparison of two numbers, the actual and the expected deaths, a comparison in which the influences of the factors according to which the material was subdivided have been eliminated, and which therefore shows the true influence upon mortality of the factor studied, independent of that of the eliminated factors.

A further advantage in summarizing the evidence lies in the fact that the range of variation due to chance, which in each group becomes relatively large when the material is subdivided and the number of cases is reduced, becomes relatively small when the results from all the groups are added together; the conclusion, indeed, secures the full value of the weight attached to the total number of cases in the comparison.

APPENDIX D.—GENERAL TABLES

GENERAL TABLE 1.—*Cause of death, by month of life in which death occurred; infant deaths in eight cities*

Cause of death	Total infant deaths	Infant deaths occurring in specified month of life													
		First			Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
		Total	Under 2 weeks	2 weeks, under 1 month											
All causes	2,555	1,028	834	194	204	175	173	165	156	132	122	119	109	80	92
Gastric and intestinal diseases	743	69	28	41	63	81	75	79	81	71	51	48	53	36	36
Diseases of the stomach	24	9	5	4	2	4	4	2	1	1				1	
Diarrhea and enteritis	719	60	23	37	61	77	71	77	80	70	51	48	53	35	36
Respiratory diseases	450	66	31	35	45	38	46	33	33	33	41	36	29	25	25
Acute bronchitis	70	14	3	11	10	8	3	5	8	4	5	6	3	3	1
Broncho-pneumonia	267	30	15	15	21	21	35	18	21	20	25	21	21	16	18
Pneumonia	113	22	13	9	14	9	8	10	4	9	11	9	5	6	6
Malformations	99	76	70	6	3	6	5	1	4		1	1	2		
Early infancy	830	697	621	76	50	17	18	13	14	7	5	3	1	1	4
Premature birth	399	389	359	30	7	2		1							
Congenital debility	343	221	176	45	42	15	18	12	14	7	5	3	1	1	4
Injuries at birth	88	87	86	1	1										
Epidemic and other communicable diseases	162	24	12	12	17	13	12	11	7	7	15	17	13	10	16
Measles	12	1		1		1					3	2	1	1	3
Scarlet fever	1														1
Whooping cough	51	1		1	6	5	8	3	3	5	4	6	3	3	4
Diphtheria and croup	10					1					1		3	2	3
Influenza	9	1	1		1	1		2			3			1	
Dysentery	5				1	1		1		1		1			
Erysipelas	12	3		3	3		1	1	1		1	1	1		
Tetanus	1	1	1												
Tuberculosis of the lungs	12				2	1	1	1	1		1	3		1	1
Tuberculous meningitis	23				2	1		1	2	1	2	4	5	2	3
Other forms of tuberculosis	3	1		1		1	1								1
Syphilis	23	16	10	6	2	1	1	2							1
External causes	14	5	3	2	1		1	1	1	2	1		2		
Diseases ill defined and unknown	58	26	23	3	4	9	3	3	2	2	1	2	2	2	2
Other causes	199	65	46	19	21	11	13	24	14	10	7	12	7	6	9
Meningitis	33	1	1		1	1	2	6	4	6	1	1	4	3	3
Convulsions	45	22	15	7	8	2	2	2	3			4	1	1	
Organic diseases of the heart	9	8	8				1								
Other	112	34	22	12	12	8	8	16	7	4	6	7	2	2	6

GENERAL TABLE 2.—*Causes of death, by calendar month of birth; infant deaths in eight cities*

Calendar month of birth	All causes	Infant deaths from specified causes							
		Gastric and intestinal diseases	Respiratory diseases	Malformations	Early infancy	Epidemic and other communicable diseases	External causes	Diseases ill defined and unknown	Other causes
Total	2,555	743	450	99	830	162	14	58	199
January	214	74	37	10	63	10	----	4	16
February	204	75	38	5	60	10	1	2	13
March	228	59	26	13	89	16	1	6	18
April	228	78	36	9	80	9	----	1	15
May	213	61	40	10	69	16	----	7	10
June	246	77	40	9	75	21	3	5	16
July	226	56	50	10	75	11	1	6	17
August	192	42	37	4	67	17	1	8	16
September	195	43	43	3	65	16	2	3	20
October	198	47	35	9	58	14	4	5	26
November	209	62	33	8	69	12	----	6	19
December	202	69	35	9	60	10	1	5	13

GENERAL TABLE 3.—*Month of life in which death occurred, by calendar month of birth; infant deaths in eight cities*

Calendar month of birth	Total infant deaths	Infant deaths occurring in specified month of life													
		First			Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
		Total	Under 2 weeks	2 weeks, under 1 month											
Total	2,555	1,028	834	194	204	175	173	165	156	132	122	119	109	80	92
January	214	92	68	24	24	10	5	7	19	24	15	7	3	6	2
February	204	85	72	13	9	10	9	15	24	19	14	3	5	2	9
March	228	108	89	19	13	6	11	24	20	15	9	3	7	7	5
April	228	90	75	15	7	11	34	26	16	8	3	8	7	6	12
May	213	81	70	11	6	30	21	16	12	4	9	11	5	10	8
June	246	83	74	9	39	25	16	15	8	10	12	9	12	10	7
July	226	96	65	31	22	27	14	7	8	6	10	14	8	5	9
August	192	83	67	16	22	9	13	11	10	6	8	11	2	4	13
September	195	78	66	12	14	9	10	12	9	7	7	10	17	9	13
October	198	73	60	13	17	11	12	14	15	9	6	10	12	11	8
November	209	83	64	19	17	11	15	12	6	5	11	14	24	7	4
December	202	76	64	12	14	16	13	6	9	19	18	19	7	3	2

GENERAL TABLE 4.—*Infant mortality rates, by sex and term; live births in eight cities*

Period of gestation and sex	Total births	Live births	Infant deaths		Stillbirths	
			Number	Infant mortality rates [1]	Number	Per cent [1]
Total	23,780	22,967	2,555	111.2	813	3.4
Full term	22,241	21,759	1,917	88.1	482	2.2
Premature	1,488	1,158	626	540.6	330	22.2
Less than 7 months	145	145	137	944.8		
7 months and over	1,336	1,007	483	479.6	329	24.6
Period not reported	7	6	6		1	
Term not reported	51	50	12		1	
Male	12,115	11,675	1,436	123.0	440	3.6
Full term	11,303	11,027	1,072	97.2	276	2.4
Premature	793	629	359	570.7	164	20.7
Less than 7 months	71	71	67			
7 months and over	718	555	289	520.7	163	22.7
Period not reported	4	3	3		1	
Term not reported	19	19	5			
Female	11,663	11,292	1,119	99.1	371	3.2
Full term	10,938	10,732	845	78.7	206	1.9
Premature	693	529	267	504.7	164	23.7
Less than 7 months	74	74	70			
7 months and over	616	452	194	429.2	164	26.6
Period not reported	3	3	3			
Term not reported	32	31	7		1	
Sex not reported	2				2	
Premature: 7 months and over	2				2	

[1] Not shown where base is less than 100.

GENERAL TABLE 5.—*Prevalence of artificial feeding, by sex and month of life; infants in eight cities*

Sex	Infants surviving at beginning of third month			Infants surviving at beginning of sixth month			Infants surviving at beginning of ninth month		
	Total	Artificially fed during third month		Total	Artificially fed during sixth month		Total	Artificially fed during ninth month	
		Number	Per cent		Number	Per cent		Number	Per cent
Total	21,735	4,431	20.4	21,222	6,145	29.0	20,812	7,268	34.9
Male	10,955	2,288	20.9	10,685	3,154	29.5	10,445	3,702	35.4
Female	10,780	2,143	19.9	10,537	2,991	28.4	10,367	3,566	34.4

GENERAL TABLE 6.—*Proportion of births to mothers of nationalities with high infant mortality rates, by sex; live births in eight cities*

Sex	Live births—		
	Total	To mothers of nationalities with high infant mortality rates [1]	
		Number	Per cent
Total	22,967	7,428	32.3
Male	11,675	3,732	32.0
Female	11,292	3,696	32.7

[1] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored.

GENERAL TABLE 7.—*Infant mortality, by cause of death, term, and interval between confinement and death of mother; births in eight cities to mothers who died at or within one year after confinement*

Term and interval between confinement and death of mother	Births to mothers who died at or within one year after confinement						
	Total	Live births	Infant deaths from specified causes				Still-births
			All causes	Gastric and intestinal diseases	Early infancy	Other causes	
Total	172	140	63	11	36	16	32
Full term	132	111	35	11	11	13	21
Premature	38	28	27	----	24	3	10
Period of gestation not reported	2	1	1	----	1	----	1
Mother died within 1 month	83	56	34	3	26	5	27
Full term	52	33	12	3	6	3	19
Premature	29	22	21	----	19	2	7
Period of gestation not reported	2	1	1	----	1	----	1
Mother died after 1 month	84	79	29	8	10	11	5
Full term	75	73	23	8	5	10	2
Premature	9	6	6	----	5	1	3
Interval not reported: Full term	5	5	----	----	----	----	----

GENERAL TABLE 8.—*Type of feeding, by month of life; infants in eight cities whose mothers died at or within one year after confinement*

Month of life	Infants whose mothers died at or within one year after confinement				
	Total	Breast fed	Partly breast fed	Artificially fed	Feeding not reported
First	[1] 140	51	1	64	3
Second	109	30	1	77	1
Third	101	19	----	82	----
Fourth	97	14	1	82	----
Fifth	92	10	1	81	----
Sixth	88	7	----	81	----
Seventh	87	5	2	80	----
Eighth	84	5	2	77	----
Ninth	82	1	3	78	----
Tenth	80	----	2	78	----
Eleventh	80	----	1	79	----
Twelfth	79	----	1	78	----

[1] Including 21 infants that died not fed.

GENERAL TABLE 9.—*Prevalence of breast and artificial feeding, by death or survival of mother during year after confinement; infants in eight cities*

Death of mother at or within year after confinement	Months lived from birth to end of ninth							
	Total	Months of breast feeding		Months of partly breast feeding		Months of artificial feeding		Feeding not reported (number) [1]
		Number	Per cent	Number	Per cent	Number	Per cent	
Total	192,212.5	110,384	57.4	33,904.5	17.6	47,842	24.9	82
Mother died	839.5	139	16.6	11.0	1.3	686.5	81.8	3
Mother survived the year	191,373.0	110,245	57.6	33,893.5	17.7	47,155.5	24.6	79

[1] Per cent not shown for "not reported" group because not significant.

GENERAL TABLE 10.—*Mortality among infants whose mothers died at or within one year after confinement as compared with all other infants, when influence of differences in type of feeding is eliminated; infants in eight cities*

Type of feeding	Deaths of infants of mothers who died at or within one year after confinement [1]				
	Actual	Expected at average rates for all infants		Expected at average rates for infants receiving the same type of feeding	
		Number	Ratio [2]	Number	Ratio [2]
Total	32	7.59	4.22	13.06	2.45
Breast	3			.37	
Partly breast				.06	
Artificial	29			12.63	

[1] Excluding infant deaths in the first month.
[2] Ratio of actual to expected.

GENERAL TABLE 11.—*Causes of death of infants in Baltimore, according to whether mother had had tuberculosis*

Cause of death	Deaths of infants—		
	Total	Whose mothers had had tuberculosis	Whose mothers had not had tuberculosis
All causes	1,117	26	1,091
Gastric and intestinal diseases	314	11	303
Respiratory diseases	213	6	207
Malformations	39		39
Early infancy	407	6	401
Epidemic and other communicable diseases	72	3	69
Tuberculosis	15	3	12
External causes	10		10
Diseases ill defined and unknown	7		7
Other causes	55		55

GENERAL TABLE 12.—*Proportion of births to mothers in Baltimore who had convulsions as a complication of confinement, by term, and cause of infant's death*

Survival or death of infant and cause of death	Births to mothers who had convulsions as a complication of confinement				
	Total	Live births			Still-births
		Total	Premature	Full term	
Total	53	42	15	27	11
Live-born infants—					
Who survived year	27	27	5	22	----
Who died within year	15	15	10	5	----
From causes peculiar to early infancy	11	11	10	1	----
From other causes	4	4	----	4	----
Stillbirths	11	----	----	----	11

GENERAL TABLE 13.—*Infant mortality rates, by cause of infant's death and medical prenatal care of mother; live births in Baltimore*

Medical prenatal care of mother	Live births	Infant deaths									
		All causes		Gastric and intestinal diseases		Respiratory diseases		Early infancy		Other causes	
		Number	Infant mortality rates[1]	Number	Infant mortality rates[1]	Number	Infant mortality rates[1]	Number	Infant mortality rates[1]	Number	Infant mortality rates[1]
Total	10,797	1,117	103.5	314	29.1	213	19.7	407	37.7	183	16.9
No medical prenatal care	5,120	580	113.3	178	34.8	119	23.2	190	37.1	93	18.2
Medical prenatal care	5,660	531	93.8	133	23.5	94	16.6	215	38.0	89	15.7
Not reported	17	6	----	3	----	----	----	2	----	1	----

[1] Not shown where base is less than 100.

GENERAL TABLE 14.—*Monthly death rates, by age of mother and month of life; infants in eight cities*

Age of mother	Live births	Infant deaths	Infant mortality rates	Monthly death rates											
				First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	22,967	2,555	111.2	44.8	9.3	8.1	8.0	7.7	7.4	6.3	5.8	5.7	5.3	3.9	4.5
Under 20	1,584	215	135.7	63.1	11.5	9.5	12.4	7.7	7.0	5.7	5.7	6.4	2.9	2.9	8.7
20–24	6,879	753	109.5	43.5	9.9	7.8	8.2	7.2	5.5	7.0	5.2	5.4	6.9	4.4	3.7
25–29	6,618	671	101.4	42.0	7.4	6.5	6.6	6.3	8.4	5.7	6.1	5.3	4.3	3.3	3.9
30–34	4,231	443	104.7	38.5	9.8	7.7	7.0	10.1	6.9	7.4	5.2	6.2	3.9	2.9	3.9
35–39	2,688	340	126.5	50.2	10.6	10.3	10.4	9.3	9.4	4.5	7.0	5.8	5.9	5.5	4.7
40 and over	958	131	136.7	54.3	9.9	12.3	7.9	6.8	10.3	5.8	8.1	7.0	8.3	6.0	8.4
Not reported	9	2	----	----	----	----	----	----	----	----	----	----	----	----	----

[1] Not shown where base is less than 100.

GENERAL TABLE 15.—*Age of mother, by order of birth; live births in eight cities*

Order of birth	Live births							
	Total	Age of mother						
		Under 20	20–24	25–29	30–34	35–39	40 and over	Not reported
Total	22,967	1,584	6,879	6,618	4,231	2,688	958	9
First	6,230	1,227	3,125	1,349	399	114	14	2
Second	4,954	311	2,196	1,621	599	204	22	1
Third	3,328	39	968	1,407	609	260	45	----
Fourth	2,481	5	412	1,043	694	268	57	2
Fifth	1,767	2	133	624	631	306	69	2
Sixth	1,263	----	32	339	480	326	85	1
Seventh	921	----	9	138	353	320	101	----
Eighth	677	----	3	68	226	289	91	----
Ninth	470	----	1	20	126	224	98	1
Tenth and later	876	----	----	9	114	377	376	----

GENERAL TABLE 16.—*Relative mortality, by age of mother, when influence of order of birth, interval since preceding birth, and both factors together, is eliminated; live births in eight cities and live births in Baltimore*

Age of mother	Infant deaths in eight cities				Infant deaths in Baltimore (single births)					
	Actual	Expected at average rate for births of same order		Ratio of rate in specified group to average rate (per cent) [1]	Actual	Expected at average rates for single births—				Ratio of rate in specified group to average rate (per cent) [1]
						Following preceding birth after same interval		Of same order and following preceding birth after same interval		
		Number	Ratio (per cent) [1]			Number	Ratio (per cent) [1]	Number	Ratio (per cent) [1]	
Total	2,555	2,553.9	100.0	100.0	764	764.0	100.0	763.7	100.0	100.0
Under 20	215	162.9	132.0	122.0	38	28.0	135.7	24.3	156.4	124.9
20–24	753	704.2	106.9	98.3	191	196.0	97.4	175.8	108.6	98.7
25–29	671	705.1	95.2	91.2	201	234.7	85.6	223.0	90.1	85.6
30–34	443	490.3	90.4	94.2	155	165.4	93.7	170.0	91.2	91.8
35–39	340	348.6	97.5	113.8	133	104.2	127.6	121.7	109.3	124.7
40 and over	131	141.9	92.3	122.9	45	35.3	127.5	48.3	93.2	121.3
Not reported	2	.9	----	----	1	.4	----	.6	----	----

[1] Not shown for "not reported" group because not significant.

GENERAL TABLE 17.—*Order of birth, by interval since preceding birth* [1] *and age of mother; single live births in Baltimore second and later in order*

Order of birth and interval since preceding birth [1]	Single live births second and later in order						
	Total	Age of mother					
		Under 20	20–24	25–29	30–34	35–39	40 and over
Second birth	2,372	206	1,069	761	264	62	10
1 year	703	114	376	161	44	7	1
2 years	863	80	454	257	58	13	1
3 years	339	12	154	121	40	9	3
4 years and over	466	-------	85	221	122	33	5
Interval not reported	1	-------	-------	1	-------	-------	-------
Third birth	1,435	26	460	577	249	103	20
1 year	381	23	178	131	39	9	1
2 years	518	3	194	224	66	25	6
3 years	220	-------	64	92	48	13	3
4 years and over	309	-------	21	127	95	56	10
Interval not reported	7	-------	3	3	1	-------	-------
Fourth birth	1,095	4	211	458	288	107	27
1 year	242	3	90	101	36	10	2
2 years	416	1	90	191	95	33	6
3 years	205	-------	22	106	56	19	2
4 years and over	225	-------	8	57	98	45	17
Interval not reported	7	-------	1	3	3	-------	-------
Fifth birth	[2] 795	2	80	279	282	127	23
1 year	[3] 174	2	40	63	53	14	1
2 years	301	-------	31	141	95	28	6
3 years	167	-------	8	58	75	26	-------
4 years and over	146	-------	-------	15	57	58	16
Interval not reported	[3] 7	-------	1	2	2	1	-------
Sixth birth	[3] 596	-------	23	168	236	130	38
1 year	137	-------	14	61	48	12	2
2 years	225	-------	8	76	95	39	7
3 years	[3] 132	-------	1	22	61	40	7
4 years and over	98	-------	-------	8	29	39	22
Interval not reported	4	-------	-------	1	3	-------	-------
Seventh birth	426	-------	3	77	168	140	38
1 year	114	-------	2	44	44	23	1
2 years	149	-------	1	27	61	51	9
3 years	82	-------	-------	4	37	35	6
4 years and over	76	-------	-------	2	24	30	20
Interval not reported	5	-------	-------	-------	2	1	2
Eighth birth	329	-------	2	48	114	126	39
1 year	81	-------	2	19	34	22	4
2 years	136	-------	-------	21	54	53	8
3 years	66	-------	-------	6	18	31	11
4 years and over	42	-------	-------	2	7	17	16
Interval not reported	4	-------	-------	-------	1	3	-------
Ninth birth	[3] 235	-------	1	12	60	122	39
1 year	64	-------	1	8	28	24	3
2 years	95	-------	-------	3	25	55	12
3 years	38	-------	-------	1	5	22	10
4 years and over	35	-------	-------	-------	1	20	14
Interval not reported	[3] 3	-------	-------	-------	1	1	-------
Tenth and later births	424	-------	-------	5	67	194	158
1 year	130	-------	-------	4	30	66	30
2 years	164	-------	-------	1	29	81	53
3 years	67	-------	-------	-------	1	27	39
4 years and over	54	-------	-------	-------	5	15	34
Interval not reported	9	-------	-------	-------	2	5	2

[1] For definition of interval see p. 60.
[2] Including 2 births for which age of mother was not reported.
[3] Including 1 birth for which age of mother was not reported.

GENERAL TABLE 18.—*Proportion of births following preceding birth at short intervals, by order of birth and age of mother; single live births in Baltimore*

Order of birth	Per cent of live births following preceding birth at short intervals[1]						
	Total	Age of mother					
		Under 20	20–24	25–29	30–34	35–39	40 and over
Second	29.6	55.3	35.2	21.2	16.7	11.3	
Third	26.6		38.7	22.7	15.7	8.7	
Fourth	22.1		42.7	22.1	12.5	9.3	
Fifth	21.9		50.0	22.6	18.8	11.0	
Sixth	23.0			36.3	20.3	9.2	
Seventh	26.8			57.1	26.2	16.4	
Eighth	24.6				29.8	17.5	
Ninth	27.2				46.7	19.7	
Tenth and later	30.7				44.8	34.0	19.0

[1] Not shown where base is less than 50. For definition of interval see p. 60.

GENERAL TABLE 19.—*Proportion of premature births, by age of mother, when influence of order of birth is eliminated; live births in eight cities*

Age of mother	Premature births			Age of mother	Premature births		
	Actual	Expected	Ratio of actual to expected (per cent)		Actual	Expected	Ratio of actual to expected (per cent)
Total	1,158	1,158.4	100.0	30–34	182	180.7	100.7
				35–39	110	113.6	96.8
Under 20	137	107.4	127.6	40 and over	46	41.3	111.4
20–24	368	399.0	92.2	Not reported	1		
25–29	314	316.4	99.2				

GENERAL TABLE 20.—*Relative mortality, by age of mother, when influence of prematurity is eliminated; live births in eight cities*

Age of mother	Infant deaths			Age of mother	Infant deaths		
	Actual	Expected[1]	Ratio of actual to expected (per cent)[2]		Actual	Expected[1]	Ratio of actual to expected (per cent)[2]
Total	2,555	2,554.9	100.0	30–34	443	456.5	97.0
				35–39	340	287.5	118.3
Under 20	215	202.0	106.4	40 and over	131	105.6	124.1
20–24	753	774.8	97.2	Not reported	2	1.2	
25–29	671	727.3	92.3				

[1] Expected at average rates for full-term and premature births, irrespective of age of mother.
[2] Not shown for "not reported" group because not significant.

GENERAL TABLE 21.—*Proportion of confinements with instrumental delivery, by age of mother; confinements in Baltimore*

Age of mother	Confinements—			Age of mother	Confinements—		
	Total	With instrumental delivery			Total	With instrumental delivery	
		Number	Per cent [1]			Number	Per cent [1]
Total	11,463	866	7.6	30–34	2,068	151	7.3
Under 20	1,020	84	8.2	35–39	1,289	88	6.8
20–24	3,461	279	8.1	40 and over	443	23	5.2
25–29	3,178	241	7.6	Not reported	4		

[1] Not shown where base is less than 100.

GENERAL TABLE 22.—*Prevalence of artificial feeding, by age of mother and month of infant's life; infants in eight cities*

Age of mother	Infants surviving at beginning of third month			Infants surviving at beginning of sixth month			Infants surviving at beginning of ninth month		
	Total	Artificially fed during third month		Total	Artificially fed during sixth month		Total	Artificially fed during ninth month	
		Number	Per cent		Number	Per cent		Number	Per cent
Total	21,735	4,431	20.4	21,222	6,145	29.0	20,812	7,268	34.9
Under 20	1,467	301	20.5	1,424	433	30.4	1,398	516	36.9
20–24	6,515	1,291	19.8	6,365	1,867	29.3	6,253	2,265	36.2
25–29	6,294	1,184	18.8	6,172	1,740	28.2	6,048	2,076	34.3
30–34	4,028	836	20.8	3,929	1,085	27.6	3,853	1,277	33.1
35–39	2,526	569	22.5	2,451	730	29.8	2,400	825	34.4
40 and over	897	249	27.8	873	289	33.1	852	307	36.0
Not reported	8	1	12.5	8	1	12.5	8	2	25.0

GENERAL TABLE 23.—*Age of mother, by color and nationality of mother; live births in eight cities*

Color and nationality of mother	Live births							
	Total	Age of mother						
		Under 20	20–24	25–29	30–34	35–39	40 and over	Not reported
Total	22,967	1,584	6,879	6,618	4,231	2,688	958	9
White	21,510	1,403	6,400	6,270	3,986	2,534	911	6
Native	12,102	1,064	3,976	3,451	2,017	1,187	407	
Foreign born	9,408	339	2,424	2,819	1,969	1,347	504	6
Italian	1,426	77	404	410	274	182	78	1
Jewish	1,233	30	309	399	275	177	43	
French-Canadian	1,074	24	221	303	237	191	98	
German	776	40	190	176	174	129	67	
Polish	1,266	67	401	397	226	131	43	1
Portuguese	669	38	201	210	111	80	29	
Other	2,962	63	697	924	671	457	146	4
Not reported	2		1		1			
Colored	1,457	181	479	348	245	154	47	3

GENERAL TABLE 24.—*Age of mother, by earnings of father and whether first or later births; live births in seven cities*

Order of birth and age of mother	Live births									
	Total	Earnings of father								
		Less than $450	$450–$549	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
Total	21,536	3,085	2,825	2,910	5,050	3,345	1,391	2,252	313	365
First births	5,908	638	658	776	1,464	1,054	447	697	85	89
Under 20	1,160	184	185	200	287	163	56	42	32	11
20–24	2,949	319	342	403	777	540	212	281	35	40
25–29	1,295	100	98	117	291	269	133	245	11	31
30–34	377	24	27	41	82	65	31	98	5	4
35–39	111	7	4	15	22	16	15	29	2	1
40 and over	14	3	2		4	1		2		2
Not reported	2	1			1					
Second and later births	15,628	2,447	2,167	2,134	3,586	2,291	944	1,555	228	276
Under 20	343	88	60	65	64	35	8	7	8	8
20–24	3,485	563	578	524	860	485	165	194	59	57
25–29	4,941	721	663	642	1,204	757	314	497	63	80
30–34	3,585	503	428	491	783	556	243	468	44	69
35–39	2,397	414	328	289	476	341	162	300	45	42
40 and over	870	153	109	123	198	117	52	89	9	20
Not reported	7	5	1		1					

GENERAL TABLE 25.—*Age of mother, by per capita income from father's earnings; live births in seven cities*

Age of mother	Live births [1]					
	Total	Per capita income from father's earnings				
		Less than $50	$50–$99	$100–$199	$200–$399	$400 and over
Total	18,587	227	2,948	6,900	8,000	512
Under 20	1,392	1	6	348	973	64
20–24	5,765		215	1,816	3,490	244
25–29	5,325	4	739	2,170	2,260	152
30–34	3,256	41	805	1,501	873	36
35–39	2,083	106	805	808	349	15
40 and over	758	75	376	253	53	1
Not reported	8		2	4	2	

[1] Excluding births in earnings groups "$1,250 and over," "no earnings," and "earnings not reported," and 19 infants for whom the number in the family was not reported or who lived in institutions.

GENERAL TABLE 26.—*Monthly death rates, by order of birth and month of life; infants in eight cities*

Order of birth	Live births	Infant deaths	Infant mortality rates	Monthly death rates											
				First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	22,967	2,555	111.2	44.8	9.3	8.1	8.0	7.7	7.4	6.3	5.8	5.7	5.3	3.9	4.5
First	6,230	652	104.7	53.6	8.3	5.5	6.0	5.9	4.9	4.5	4.2	4.8	4.6	2.0	4.6
Second	4,954	474	95.7	39.2	8.8	7.6	8.1	5.4	6.3	4.8	4.6	4.6	4.2	3.8	2.2
Third	3,328	348	104.6	41.5	9.1	6.6	8.6	7.4	7.8	6.2	4.6	5.6	3.6	4.3	4.0
Fourth	2,481	270	108.8	35.9	8.4	7.6	5.9	8.5	6.9	9.1	7.9	6.6	5.3	5.4	6.7
Fifth	1,767	210	118.8	40.2	8.8	6.5	12.0	13.3	10.4	7.4	5.0	6.9	7.0	2.5	5.1
Sixth	1,263	155	122.7	39.6	9.1	13.3	9.3	6.0	9.4	9.5	11.3	3.5	7.1	8.0	3.6
Seventh	921	126	136.8	40.2	12.4	19.5	7.0	14.1	11.9	4.8	12.1	8.6	8.7	----	6.3
Eighth	677	92	135.9	48.7	9.3	9.4	9.5	16.0	9.7	4.9	4.9	11.6	8.4	8.4	3.4
Ninth	470	69	146.8	46.8	15.6	11.3	11.5	7.0	11.7	9.5	9.5	7.2	7.3	12.2	7.4
Tenth and later	876	159	181.5	68.5	18.4	15.0	13.9	11.6	13.0	13.2	9.3	9.4	9.5	5.5	9.7

GENERAL TABLE 27.—*Relative mortality, by order of birth, when influence of prematurity and plurality of birth is eliminated; live births in eight cities*

Order of birth	Infant deaths			Order of birth	Infant deaths		
	Actual	Expected	Ratio of actual to expected (per cent)		Actual	Expected	Ratio of actual to expected (per cent)
Total	2,555	2,555.1	100.0	Fifth	210	182.7	114.9
First	652	747.4	87.2	Sixth	155	136.3	113.7
Second	474	547.3	86.6	Seventh	126	96.9	130.0
Third	348	358.6	97.0	Eighth	92	73.5	125.2
Fourth	270	262.3	102.9	Ninth	69	52.4	131.8
				Tenth and later	159	97.7	162.7

GENERAL TABLE 28.—*Relative mortality, by order of birth, when influence of interval since preceding birth and when influences of both interval since preceding birth and age of mother are eliminated; single live births in Baltimore second and later in order*

Order of birth	Infant deaths						
	Actual	Expected at average rate for all single births second and later in order		Expected at average rate—			
				For same interval		For same interval and age of mother	
		Number	Ratio (per cent)[1]	Number	Ratio (per cent)[1]	Number	Ratio (per cent)[1]
Total	764	763.9	100.0	763.6	100.1	765.0	99.9
Second	208	235.1	88.5	238.9	87.1	235.7	88.2
Third	126	142.3	88.6	142.2	88.6	135.4	93.1
Fourth	104	108.5	95.8	105.9	98.2	102.7	101.3
Fifth	80	78.8	101.5	77.0	103.9	73.7	108.6
Sixth	57	59.1	96.5	58.0	98.3	57.2	99.7
Seventh	47	42.2	111.3	42.3	111.1	45.7	102.8
Eighth and later	142	97.9	145.0	99.3	143.0	114.6	123.9

[1] Ratio of actual to expected.

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GENERAL TABLE 29.—*Proportion of confinements with instrumental delivery, by order of birth; confinements in Baltimore*

Order of birth	Confinements—			Order of birth	Confinements—		
	Total	With instrumental delivery			Total	With instrumental delivery	
		Number	Per cent			Number	Per cent
Total	11,463	866	7.6	Fifth	870	37	4.3
First	3,050	510	16.7	Sixth	665	14	2.1
Second	2,532	132	5.2	Seventh	467	18	3.9
Third	1,580	67	4.2	Eighth	361	16	4.4
Fourth	1,197	50	4.2	Ninth	261	9	3.4
				Tenth and later	480	13	2.7

GENERAL TABLE 30.—*Prevalence of artificial feeding, by order of birth and month of life; infants in eight cities*

Order of birth	Infants surviving at beginning of third month			Infants surviving at beginning of sixth month			Infants surviving at beginning of ninth month		
	Total	Artificially fed during third month		Total	Artificially fed during sixth month		Total	Artificially fed during ninth month	
		Number	Per cent		Number	Per cent		Number	Per cent
Total	21,735	4,431	20.4	21,222	6,145	29.0	20,812	7,268	34.9
First	5,854	1,259	21.5	5,755	1,823	31.7	5,680	2,240	39.4
Second	4,716	948	20.1	4,624	1,370	29.6	4,551	1,601	35.2
Third	3,166	580	18.3	3,089	847	27.4	3,030	1,036	34.2
Fourth	2,371	444	18.7	2,317	618	26.7	2,266	731	32.3
Fifth	1,681	325	19.3	1,628	414	25.4	1,588	472	29.7
Sixth	1,203	234	19.5	1,169	297	25.4	1,134	334	29.5
Seventh	865	169	19.5	828	210	25.4	803	233	29.0
Eighth	637	136	21.4	617	174	28.2	606	201	33.2
Ninth	443	92	20.8	428	108	25.2	415	114	27.5
Tenth and later	799	244	30.5	767	284	37.1	739	306	41.4

GENERAL TABLE 31.—*Order of birth, by color and nationality of mother; live births in eight cities*

Order of birth	Live births											
	Total	Color and nationality of mother										
		White										Colored
		Total	Native	Foreign born								
				Total	Italian	Polish	Jewish	French-Canadian	German	Portuguese	Other	
Total	22,967	21,510	12,102	[1] 9,408	1,426	1,266	1,233	1,074	776	669	2,962	1,457
First	6,230	5,962	4,054	[2] 1,908	234	253	235	202	149	127	707	268
Second	4,954	4,666	2,915	1,751	234	225	255	179	157	111	590	288
Third	3,328	3,116	1,682	[2] 1,434	226	188	204	122	124	101	468	212
Fourth	2,481	2,304	1,157	1,147	192	160	133	114	91	99	358	177
Fifth	1,767	1,631	722	909	158	132	136	94	63	71	255	136
Sixth	1,263	1,164	525	639	116	77	81	77	52	42	194	99
Seventh	921	845	337	508	97	71	68	58	38	36	140	76
Eighth	677	609	249	360	55	56	48	59	26	21	95	68
Ninth	470	433	172	261	44	42	30	38	25	15	67	37
Tenth and later	876	780	289	491	70	62	43	131	51	46	88	96

[1] Including 2 births for which nationality of mother was not reported.
[2] Including 1 birth for which nationality of mother was not reported.

GENERAL TABLE 32.—*Order of birth, by earnings of father; live births in seven cities*

Order of birth	Live births									
	Total	Earnings of father								
		Less than $450	$450–$549	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
Total	21,536	3,085	2,825	2,910	5,050	3,345	1,391	2,252	313	365
First	5,908	638	658	776	1,464	1,054	447	697	85	89
Second	4,681	570	586	594	1,109	784	307	590	63	78
Third	3,115	442	396	386	737	515	209	335	42	53
Fourth	2,302	371	332	344	528	295	145	222	31	34
Fifth	1,632	287	235	230	383	230	86	127	21	33
Sixth	1,172	201	177	179	256	142	63	107	26	21
Seventh	847	168	141	121	188	108	42	55	10	14
Eighth	622	118	102	106	119	77	29	45	12	14
Ninth	437	103	58	61	96	46	25	27	11	10
Tenth and later	820	187	140	113	170	94	38	47	12	19

GENERAL TABLE 33.—*Order of birth, by per capita income from father's earnings; live births in seven cities* [1]

Order of birth	Live births [1]					
	Total	Per capita income from father's earnings				
		Less than $50	$50–$99	$100–$199	$200–$399	$400 and over
Total	18,587	227	2,948	6,900	8,000	512
First	5,026	----------	11	611	3,943	461
Second	3,947	----------	10	1,485	2,412	40
Third	2,683	1	235	1,398	1,040	9
Fourth	2,014	----------	441	1,217	356	----------
Fifth	1,452	----------	494	808	148	2
Sixth	1,018	3	424	536	55	----------
Seventh	768	24	365	360	19	----------
Eighth	550	28	302	209	11	----------
Ninth	389	47	210	126	6	----------
Tenth and later	740	124	456	150	10	----------

[1] Excluding births in the earnings groups "$1,250 and over," "no earnings," and "earnings not reported," and 19 infants in earnings groups under $1,250 for whom number in family was not reported or who lived in institutions.

GENERAL TABLE 34.—*Monthly death rates, by interval since preceding birth* [1] *and month of life; infants in Baltimore*

Interval since preceding birth [1]	Live births	Infant deaths	Infant mortality rate	Monthly death rates [2]											
				First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	10,797	1,117	103.5	44.2	6.3	6.1	6.1	7.0	7.6	5.6	5.6	5.2	5.0	4.3	5.0
First births	2,868	272	94.8	52.3	4.4	4.4	3.7	6.7	3.8	2.6	4.5	3.0	4.6	2.3	5.7
Second and later births	7,929	845	106.6	41.2	7.0	6.8	6.9	7.1	8.9	6.7	6.0	5.9	5.1	5.0	4.8
Interval 1 year	2,072	304	146.7	51.2	7.6	13.3	9.9	6.3	13.7	11.2	8.1	12.0	7.7	9.5	6.2
Interval 2 years	2,950	291	98.6	37.3	7.7	5.3	6.4	7.5	6.9	6.2	6.6	3.0	5.2	6.0	4.9
Interval 3 years	1,364	118	86.5	36.7	2.3	4.6	5.4	7.7	8.5	7.0	3.2	3.2	4.0	0.8	6.4
Interval 4 years and over	1,496	127	84.9	38.1	9.0	2.8	5.6	7.1	7.1	1.4	4.3	6.5	2.9	1.5	1.5
Interval not reported	47	5	------	----	----	----	----	----	----	----	----	----	----	----	----

[1] For definition of interval see p. 60.

[2] Not shown where base is less than 100.

GENERAL TABLE 35.—*Per cent of premature births, by order of birth and interval since preceding birth [1]; live births in Baltimore*

Order of birth	Per cent of premature births				
	Total	Interval since preceding birth [1]			
		One year	Two years	Three years	Four years
Total	5.5	6.4	3.6	3.7	4.6
First	8.0				
Second	5.3	7.2	4.0	4.6	5.5
Third	4.7	6.5	3.8	2.2	5.9
Fourth	3.6	4.7	2.8	3.8	3.5
Fifth	2.7	4.6	1.9	2.3	2.0
Sixth	4.4	5.0	5.7	3.6	1.9
Seventh	3.6	5.9	2.0	2.4	4.9
Eighth and later	5.6	7.7	3.7	5.5	5.3

[1] For definition of interval see p. 60.

GENERAL TABLE 36.—*Prevalence of artificial feeding, by interval since preceding birth [1] and month of life; infants in Baltimore*

Interval since preceding birth [1]	Infants surviving at beginning of third month			Infants surviving at beginning of sixth month			Infants surviving at beginning of ninth month		
	Total	Artificially fed during third month		Total	Artificially fed during sixth month		Total	Artificially fed during ninth month	
		Number	Per cent		Number	Per cent		Number	Per cent
Total	10,255	2,006	19.6	10,059	2,725	27.1	9,871	3,153	31.9
First births	2,706	568	21.0	2,666	801	30.0	2,637	966	36.6
Second and later births	7,549	1,438	19.0	7,393	1,924	26.0	7,234	2,187	30.2
Interval 1 year	1,951	470	24.1	1,894	606	32.0	1,832	677	37.0
Interval 2 years	2,818	436	15.5	2,764	614	22.2	2,710	713	26.3
Interval 3 years	1,311	225	17.2	1,288	300	23.3	1,264	343	27.1
Interval 4 years and over	1,426	298	20.9	1,404	392	27.9	1,386	443	32.0
Interval not reported	43	9		43	12		42	11	

[1] For definition of interval see p. 60.

GENERAL TABLE 37.—*Interval since preceding birth,[1] by color and nationality of mother; live births in Baltimore*

Color and nationality of mother	Live births	First births	Second and later births: Interval since preceding birth [1]				
			One year	Two years	Three years	Four years and over	Not reported
Total	10,797	2,868	2,072	2,950	1,364	1,496	47
White	9,492	2,637	1,712	2,545	1,197	1,361	40
Native	6,739	2,133	1,174	1,669	810	930	23
Foreign born	2,753	504	538	876	387	431	17
Italian	412	56	111	146	55	39	5
Jewish	961	168	130	284	160	215	4
French-Canadian	3		2	1			
German	318	59	61	93	46	58	1
Polish	625	110	146	231	81	53	4
Other	434	111	88	121	45	66	3
Colored	1,305	231	360	405	167	135	7

[1] For definition of interval see p. 60.

GENERAL TABLE 38.—*Interval since preceding birth,*[1] *by earnings of father; live births in Baltimore second and later in order*

Interval since preceding birth[1]	Live births second and later in order									
	Total	Earnings of father								
		Less than $450	$450–$549	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
Total	7,929	1,228	1,124	1,101	1,713	1,128	476	854	148	157
One year	2,072	361	316	298	460	280	105	174	35	43
Two years	2,950	449	442	443	654	428	160	263	59	52
Three years	1,364	222	190	184	287	170	74	179	29	29
Four years and over	1,496	186	171	170	305	241	132	235	24	32
Not reported	47	10	5	6	7	9	5	3	1	1

[1] For definition of interval see p. 60.

GENERAL TABLE 39.—*Interval since preceding birth,*[1] *by per capita income from father's earnings; live births in Baltimore*

Per capita income from father's earnings	Live births[2]						
	Total	First births	Interval since preceding birth				
			One year	Two years	Three years	Four years and over	Not reported
Total	9,149	2,382	1,819	2,576	1,126	1,204	42
Less than $50	104	1	26	42	18	17	----
$50–$99	1,498	4	356	606	299	222	11
$100–$199	3,394	290	842	1,208	541	495	18
$200–$399	3,919	1,889	582	706	264	465	13
$400 and over	234	198	13	14	4	5	----

[1] For definition of interval see p. 60.
[2] Excluding births in the earnings groups "$1,250 and over," "no earnings," and "earnings not reported"; also 6 infants for whom the number in the family was not reported or who lived in institutions.

GENERAL TABLE 40.—*Prevalence of breast and artificial feeding when mother became pregnant; infants in Baltimore whose mothers became pregnant during first year of infant's life*

Type of feeding	Live births to mothers pregnant during first year of infant's life[1]												
	Total	Months in which mothers became pregnant											
		First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	1,172	4	8	39	91	160	152	173	145	139	110	88	63
Breast	240	1	3	10	17	38	36	26	38	37	14	14	6
Partly breast	234	----	1	2	5	10	23	22	27	32	45	40	27
Artificial	697	3	4	27	68	112	93	125	80	70	51	34	30
Not reported	1	----	----	----	1	----	----	----	----	----	----	----	----

[1] Omitting 28 cases in which infants died in the same month that mother became pregnant, and 60 cases in which the infant survived the year but the month of infant's life during which mother became pregnant was not reported. In 18 other cases, also omitted, in which the infant died it was not reported whether the mother's pregnancy commenced before or after the infant's death.

GENERAL TABLE 41.—*Cause of death, by month of life in which death occurred; deaths among infants in eight cities whose mothers became pregnant in some preceding month*

Month of life	Deaths from specified causes of infants whose mothers became pregnant in some preceding month					
	All causes	Gastric and intestinal diseases	Respiratory diseases	Early infancy	Epidemic and other communicable diseases	Other causes
Total	75	50	12	4	6	3
Third	3	2			1	
Fourth	1	1				
Fifth	4	1	3			
Sixth	10	9	1			
Seventh	7	4	1	2		
Eighth	7	6	1			
Ninth	9	6	1	1		1
Tenth	11	7	2	1	1	
Eleventh	12	8	3		1	
Twelfth	11	6			3	2

GENERAL TABLE 42.—*Type of feeding during months lived to end of ninth and after commencement of mother's subsequent pregnancy; infants in eight cities whose mothers became pregnant during infant's first year*

Type of feeding	Months lived from beginning of mother's subsequent pregnancy to end of ninth	
	Number	Per cent distribution
Total	2,709	100.0
Breast	307.0	11.3
Partly breast	267.5	9.9
Artificial	2,132.0	78.7
Not reported	2.5	0.1

GENERAL TABLE 43.—*Type of feeding after beginning of mother's subsequent pregnancy, by month of life; infants in Baltimore whose mothers became pregnant during first year of infant's life*

Month of life	Infants surviving at beginning of each specified month whose mothers had previously become pregnant							
	Total	Breast fed during specified month		Partly breast fed during specified month		Artificially fed during specified month		Feeding not reported (number)[2]
		Number	Per cent[1]	Number	Per cent[1]	Number	Per cent[1]	
Second	4	1				3		
Third	12	3		1		8		
Fourth	48	7		2		39		
Fifth	138	19	13.8	6	4.3	112	81.2	1
Sixth	294	41	13.9	16	5.4	236	80.3	1
Seventh	436	41	9.4	40	9.2	355	81.4	
Eighth	602	44	7.3	58	9.6	500	83.1	
Ninth	740	49	6.6	85	11.5	606	81.9	
Tenth	870	52	6.0	103	11.8	715	82.2	
Eleventh	969	47	4.9	124	12.8	798	82.4	
Twelfth	1,045	40	3.8	145	13.9	860	82.3	

[1] Not shown where base is less than 100.
[2] Per cent not shown for "not reported" group because not significant.

GENERAL TABLE 44.—*Cause of death, by term; infant deaths in eight cities*

Cause of death	Infant deaths			
	Total	Full term	Premature	Period of gestation not reported
All causes	2,555	1,917	626	12
Gastric and intestinal diseases	743	689	51	3
Diseases of the stomach	24	19	5	
Diarrhea and enteritis	719	670	46	3
Respiratory diseases	450	414	34	2
Acute bronchitis	70	57	13	
Broncho-pneumonia	267	244	21	2
Pneumonia	113	113		
Malformations	99	79	20	
Early infancy	830	356	469	5
Epidemic and other communicable diseases	162	144	17	1
Measles	12	11	1	
Scarlet fever	1	1		
Whooping cough	51	46	4	1
Diphtheria and croup	10	10		
Influenza	9	7	2	
Dysentery	5	5		
Erysipelas	12	11	1	
Tetanus	1	1		
Tuberculosis of the lungs	12	11	1	
Tuberculous meningitis	23	23		
Other forms of tuberculosis	3	3		
Syphilis	23	15	8	
External causes	14	13	1	
Diseases ill defined and unknown	58	47	10	1
Other causes	199	175	24	
Meningitis	33	32	1	
Convulsions	45	36	9	
Organic diseases of the heart	9	8	1	
Other	112	99	13	

GENERAL TABLE 45.—*Monthly death rates, by month of life and term; infants in eight cities*

Month of life	Infants surviving at beginning of specified month					
	Full term [1]			Premature		
	Total	Deaths during month	Monthly death rates	Total	Deaths during month	Monthly death rates
First	21,809	518	23.8	1,158	510	440.4
Second	21,291	177	8.3	648	27	41.7
Third	21,114	160	7.6	621	15	24.2
Fourth	20,954	165	7.9	606	8	13.2
Fifth	20,789	155	7.5	598	10	16.7
Sixth	20,634	146	7.1	588	10	17.0
Seventh	20,488	125	6.1	578	7	12.1
Eighth	20,363	108	5.3	571	14	24.5
Ninth	20,255	112	5.5	557	7	12.6
Tenth	20,143	99	4.9	550	10	18.2
Eleventh	20,044	76	3.8	540	4	7.4
Twelfth	19,968	88	4.4	536	4	7.5

[1] Including 50 infants for whom the period of gestation was not reported.

GENERAL TABLE 46.—*Infant mortality and stillbirth rates, by period of gestation and single and plural births; births in eight cities*

Period of gestation and single and plural births	Total births	Live births	Infant deaths		Stillbirths	
			Number	Infant mortality rates [1]	Number	Per cent [1]
Total	23,780	22,967	2,555	111.2	813	3.4
Full term	22,241	21,759	1,917	88.1	482	2.2
Premature	1,488	1,158	626	540.6	330	22.2
Less than 7 months	145	145	137	944.8		
7 months and over	1,336	1,007	483	479.6	329	24.6
Period not reported	7	6	6		1	
Term not reported	51	50	12		1	
Single births	23,223	22,438	2,363	105.3	785	3.4
Full term	21,818	21,352	1,801	84.3	466	2.1
Premature	1,354	1,036	550	530.9	318	23.5
Less than 7 months	119	119	112	941.2		
7 months and over	1,228	911	432	474.2	317	25.8
Period not reported	7	6	6		1	
Term not reported	51	50	12		1	
Plural births	557	529	192	362.9	28	5.0
Full term	423	407	116	285.0	16	3.8
Premature	134	122	76	622.9	12	9.0
Less than 7 months	26	26	25			
7 months and over	108	96	51		12	11.1

[1] Not shown where base is less than 100.

GENERAL TABLE 47.—*Proportion of births to mothers who died at or within one year after confinement, by term; live births in eight cities*

Term	Live births—		
	Total	To mothers who died at or within one year after confinement	
		Number	Per cent
Total	22,967	140	0.6
Full term [1]	21,809	112	.5
Premature	1,158	28	2.4

[1] Including 50 births for which the period of gestation was not reported.

GENERAL TABLE 48.—*Type of feeding, by month of life and period of gestation; infants in eight cities*

Month of life	Full-term infants [1]							
	Total	Breast fed		Partly breast fed		Artificially fed		Feeding not reported (number) [2]
		Number	Per cent	Number	Per cent	Number	Per cent	
First	[3] 21,604	18,840	87.2	657	3.0	2,099	9.7	8
Second	21,291	16,753	78.7	1,258	5.9	3,270	15.4	10
Third	21,114	15,155	71.8	1,745	8.3	4,205	19.9	9
Fourth	20,954	13,216	63.1	2,612	12.5	5,116	24.4	10
Fifth	20,789	11,990	57.7	3,256	15.7	5,533	26.6	10
Sixth	20,634	10,733	52.0	4,021	19.5	5,870	28.4	10
Seventh	20,488	8,448	41.2	5,700	27.8	6,331	30.9	9
Eighth	20,363	7,173	35.2	6,555	32.2	6,626	32.5	9
Ninth	20,255	5,715	28.2	7,552	37.3	6,981	34.5	7
Tenth	20,143	4,168	20.7	8,419	41.8	7,547	37.5	9
Eleventh	20,044	3,229	16.1	8,873	44.3	7,933	39.6	9
Twelfth	19,968	2,699	13.5	8,958	44.9	8,304	41.6	7

Month of life	Premature infants						
	Total	Breast fed		Partly breast fed		Artificially fed	
		Number	Per cent	Number	Per cent	Number	Per cent
First	[4] 818	598	73.1	29	3.5	188	23.0
Second	648	425	65.6	36	5.6	187	28.9
Third	621	354	57.0	41	6.6	226	36.4
Fourth	606	300	49.5	56	9.2	250	41.3
Fifth	598	273	45.7	61	10.2	264	44.1
Sixth	588	236	40.1	77	13.1	275	46.8
Seventh	578	193	33.4	101	17.5	284	49.1
Eighth	571	170	29.8	116	20.3	285	49.9
Ninth	557	138	24.8	132	23.7	287	51.5
Tenth	550	87	15.8	165	30.0	298	54.2
Eleventh	540	56	10.4	182	33.7	302	55.9
Twelfth	536	44	8.2	181	33.8	311	58.0

[1] Including 50 infants for whom the period of gestation was not reported.
[2] Per cent not shown for "not reported" group because not significant.
[3] Excluding 205 infants who died not fed.
[4] Excluding 340 infants who died not fed; including 3 for whom feeding was not reported.

GENERAL TABLE 49.—*Prevalence of breast and artificial feeding during first nine months, by term and single and plural births; months lived by infants in eight cities*

Term and single and plural births	Months lived from birth to end of ninth [1]							
	Total	Months of breast feeding		Months of partly breast feeding		Months of artificial feeding		Type of feeding not reported (number) [2]
		Number	Per cent	Number	Per cent	Number	Per cent	
Total	192,212.5	110,384.0	57.4	33,904.5	17.6	47,842.0	24.9	82.0
Full term	186,761.5	107,761.5	57.7	33,266.5	17.8	45,653.0	24.4	80.5
Premature	5,451	2,622.5	48.1	638.0	11.7	2,189.0	40.2	1.5
Single births	188,689.5	109,182.5	57.9	33,173.5	17.6	46,251.5	24.5	82.0
Full term	183,733	106,715.5	58.1	32,602.5	17.7	44,334.5	24.1	80.5
Premature	4,956.5	2,467.0	49.8	571.0	11.5	1,917.0	38.7	1.5
Plural births	3,523	1,201.5	34.1	731.0	20.7	1,590.5	45.1	----------
Full term	3,028.5	1,046.0	34.5	664.0	21.9	1,318.5	43.5	----------
Premature	494.5	155.5	31.4	67.0	13.5	272.0	55.0	----------

[1] In case of death the infants were considered to have lived on the average one-half the month in which they died.
[2] Per cent not shown for "not reported" group because not significant.

GENERAL TABLE 50.—*Proportion of births fifth and later in order, by term; live births in eight cities*

Term	Live births—		
	Total	Fifth and later in order	
		Number	Per cent
Total	22,967	5,974	26.0
Full term	[1] 21,809	5,747	26.4
Premature	1,158	227	19.6

[1] Including 50 births for which the period of gestation was not reported.

GENERAL TABLE 51.—*Proportion of births to mothers under 20 and to those 35 years of age and over, by term; live births in eight cities*

Term	Live births—		
	Total	To mothers under 20, and 35 and over	
		Number	Per cent
Total	22,967	5,230	22.8
Full term	[1] 21,809	4,937	22.6
Premature	1,158	293	25.3

[1] Including 50 births for which the period of gestation was not reported.

GENERAL TABLE 52.—*Proportion of births following preceding births after short intervals,*[1] *by term; live births in Baltimore*

Term	Live births second and later in order—		
	Total	Following preceding birth after short interval[1]	
		Number	Per cent
Total	7,929	2,072	26.1
Full term	[2] 7,568	1,940	25.6
Premature	361	132	36.6

[1] For definition of interval see p. 60.
[2] Including 10 births for which the period of gestation was not reported.

GENERAL TABLE 53.—*Proportion of births to mothers of nationalities with high infant mortality rates, by term; live births in eight cities*

Term	Live births—		
	Total	To mothers of nationalities with high infant mortality rates[1]	
		Number	Per cent
Total	22,967	7,428	32.3
Full term	[2] 21,809	7,136	32.7
Premature	1,158	292	25.2

[1] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored.
[2] Including 50 births for which the period of gestation was not reported.

GENERAL TABLE 54.—*Proportion of births in families in which father earned less than $650, by term; live births in seven cities*

Term	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	21,536	9,133	42.4
Full term	[1] 20,425	8,698	42.6
Premature	1,111	435	39.2

[1] Including 47 births for which the period of gestation was not reported.

GENERAL TABLE 55.—*Proportion of births to mothers employed away from home during pregnancy, by term; live births in eight cities*

Term	Live births—		
	Total	To mothers employed away from home during pregnancy	
		Number	Per cent
Total	22,967	3,084	13.4
Full term	[1] 21,809	2,897	13.3
Premature	1,158	187	16.1

[1] Including 50 births for which the period of gestation was not reported.

GENERAL TABLE 56.—*Death in infancy and survival of twins in pairs, by character of birth and period of gestation; twins in eight cities*

Character of birth and period of gestation	Pairs of twins						
	Total	Both live births			One a live birth		Both stillbirths
		Both survived the year	One survived the year, one died	Both died	Survived the year	Died	
Total	271	134	50	63	14	5	5
Both live births	247	134	50	63			
Both full term	191	116	41	34			
One full term, one premature	1	1					
Both premature	55	17	9	29			
Less than 7 months	11	1		10			
7 months and over	44	16	9	19			
One a live birth	[1] 19				14	5	
Full term	14				13	1	
Premature	5				1	4	
Less than 7 months	3				1	2	
7 months and over	2					2	
Both stillbirths	5						5

[1] Including 5 cases in which the stillborn twin was of less than 7 months' gestation.

GENERAL TABLE 57.—*Monthly death rates, by month of life and single and plural births; infants in eight cities*

Month of life	Infants surviving at beginning of specified month					
	Single births			Plural births		
	Total	Deaths during month	Monthly death rates	Total	Deaths during month	Monthly death rates
First	22,438	937	41.8	529	91	172.0
Second	21,501	186	8.7	438	18	41.1
Third	21,315	158	7.4	420	17	40.5
Fourth	21,157	158	7.5	403	15	37.2
Fifth	20,999	154	7.3	388	11	28.4
Sixth	20,845	152	7.3	377	4	10.6
Seventh	20,693	125	6.0	373	7	18.8
Eighth	20,568	104	5.1	366	18	49.2
Ninth	20,464	111	5.4	348	8	23.0
Tenth	20,353	107	5.3	340	2	5.9
Eleventh	20,246	80	4.0	338		
Twelfth	20,166	91	4.5	338	1	3.0

GENERAL TABLE 58.—*Type of feeding, by month of life and single and plural births; infants in eight cities*

Month of life	Infants: Single births							
	Total	Breast fed		Partly breast fed		Artificially fed		Feeding not reported (number) [2]
		Number	Per cent	Number	Per cent	Number	Per cent	
First	[1] 21,942	19,132	87.2	638	2.9	2,161	9.8	11
Second	21,501	16,962	78.9	1,226	5.7	3,303	15.4	10
Third	21,315	15,349	72.0	1,706	8.0	4,251	19.9	9
Fourth	21,157	13,393	63.3	2,579	12.2	5,175	24.5	10
Fifth	20,999	12,151	57.9	3,228	15.4	5,610	26.7	10
Sixth	20,845	10,871	52.2	4,009	19.2	5,955	28.6	10
Seventh	20,693	8,562	41.4	5,710	27.6	6,412	31.0	9
Eighth	20,568	7,275	35.4	6,577	32.0	6,707	32.6	9
Ninth	20,464	5,797	28.3	7,588	37.1	7,072	34.6	7
Tenth	20,353	4,214	20.7	8,482	41.7	7,648	37.6	9
Eleventh	20,246	3,247	16.0	8,952	44.2	8,038	39.7	9
Twelfth	20,166	2,709	13.4	9,040	44.8	8,410	41.7	7

Month of life	Infants: Plural births						
	Total	Breast fed		Partly breast fed		Artificially fed	
		Number	Per cent	Number	Per cent	Number	Per cent
First	[3] 480	306	63.8	48	10.0	126	26.3
Second	438	216	49.3	68	15.5	154	35.2
Third	420	160	38.1	80	19.0	180	42.9
Fourth	403	123	30.5	89	22.1	191	47.4
Fifth	388	112	28.9	89	22.9	187	48.2
Sixth	377	98	26.0	89	23.6	190	50.4
Seventh	373	79	21.2	91	24.4	203	54.4
Eighth	366	68	18.6	94	25.7	204	55.7
Ninth	348	56	16.1	96	27.6	196	56.3
Tenth	340	34	10.0	109	32.1	197	57.9
Eleventh	338	31	9.2	110	32.5	197	58.3
Twelfth	338	27	8.0	105	31.1	206	60.9

[1] Excluding 496 infants who died not fed.
[2] Per cent not shown for "not reported" group because not significant.
[3] Excluding 49 infants who died not fed.

GENERAL TABLE 59.—*Weaning of twins in pairs, by age when first twin was weaned; twins in six cities* [1]

Age when first twin was weaned	Pairs of twins both of whom were living when the first was weaned [2]			
	Total	Both weaned at the same time	One weaned, one partly breast fed	One weaned, one breast fed
Total	56	50	2	4
Under 1 month	29	27	1	1
1 month, under 2	10	9		1
2 months, under 3	4	3		1
3 months, under 4	3	1	1	1
5 months, under 6	3	3		
6 months, under 7	2	2		
7 months, under 8	1	1		
9 months, under 10	1	1		
11 months, under 12	3	3		

[1] Omitting Johnstown and Baltimore.
[2] At the end of the first year 22 pairs of twins survived of whom neither had been weaned.

GENERAL TABLE 60.—*Proportion of births to mothers under 20 and to those 35 and over, by single and plural births; live births in eight cities*

Single and plural births	Live births—		
	Total	To mothers under 20, and 35 and over	
		Number	Per cent
Total	22,967	5,230	22.8
Single	22,438	5,110	22.8
Plural	529	120	22.7

GENERAL TABLE 61.—*Proportion of births fifth and later in order, by single and plural births; live births in eight cities*

Single and plural births	Live births—		
	Total	Fifth and later in order	
		Number	Per cent
Total	22,967	5,974	26.0
Single	22,438	5,794	25.8
Plural	529	180	34.0

GENERAL TABLE 62.—*Relative mortality among plural and single births, when influence of age of mother, order of birth, and both factors is eliminated; live births in eight cities*

Order of birth; age of mother	Infant deaths: Twins and triplets								
	Actual	Expected at average rate for all single births		Expected at average rates for single births—					
				Of same order of birth		To mothers of same age		Of same order of birth and to mothers of same age	
		Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Total	192	55.7	3.45	57.0	3.37	55.2	3.48	55.7	3.45
ORDER OF BIRTH									
First	34			9.6	3.54			9.1	3.74
Second	33			9.0	3.67			8.7	3.79
Third	23			9.5	2.42			9.3	2.47
Fourth	22			6.1	3.61			6.3	3.49
Fifth	22			5.5	4.00			5.3	4.15
Sixth	23			5.8	3.97			5.9	3.90
Seventh	5			3.2	1.56			3.3	1.52
Eighth	7			1.7	4.12			1.6	4.38
Ninth	5			1.1	4.55			1.0	5.00
Tenth and later	18			5.5	3.27			5.2	3.46
AGE OF MOTHER									
Under 20 years	9					1.7	5.29	1.8	5.03
20–24	54					12.8	4.22	13.4	4.03
25–29	52					15.4	3.38	15.3	3.41
30–34	40					12.2	3.28	11.8	3.38
35–39	26					9.9	2.63	9.9	2.63
40 years and over	11					3.2	3.44	3.6	3.09

GENERAL TABLE 63.—*Proportion of births to mothers of nationalities [1] with high infant mortality rates, by single and plural births; live births in eight cities*

Single and plural births	Live births—		
	Total	To mothers of nationalities with high infant mortality rates [1]	
		Number	Per cent
Total	22,967	7,428	32.3
Single	22,438	7,272	32.4
Plural	529	156	29.5

[1] Including French-Canadian, Polish, Portuguese, "other foreign born," and colored.

GENERAL TABLE 64.—*Proportion of births in families in which father earned less than $650, by single and plural births; live births in eight cities*

Single and plural births	Live births—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	21,536	9,133	42.4
Single	21,054	8,913	42.3
Plural	482	220	45.6

GENERAL TABLE 65.—*Prevalence of plural births among births preceded by plural births; all pregnancies reported by mothers of infants in eight cities*

Order of pregnancy	Pregnancies not preceded by plural births—			Pregnancies preceded by plural births—		
	Total	Resulting in plural births		Total	Resulting in plural births	
		Number	Per 1,000		Actual number [1]	Expected number [2]
Total	74,485	725	9.7	1,507	45	18.4
First	22,061	179	8.1	----------	----------	----------
Second	15,900	118	7.4	130	----------	1.0
Third	11,127	120	10.8	161	----------	1.7
Fourth	7,956	94	11.8	189	----------	2.2
Fifth	5,589	65	11.6	204	----------	2.4
Sixth	3,934	48	12.2	182	----------	2.2
Seventh	2,756	29	10.5	160	----------	1.7
Eighth	1,888	21	11.1	130	----------	1.4
Ninth	1,273	13	10.2	109	----------	1.1
Tenth and later	2,001	38	19.0	242	----------	4.6

[1] Details as to distribution by order of pregnancy not available.
[2] Expected at the rate shown in column 3.

GENERAL TABLE 66.—*Proportion of confinements in families in which father earned less than $650, by type of delivery; confinements in Baltimore*

Type of delivery	Confinements—		
	Total	In families in which father earned less than $650	
		Number	Per cent
Total	11,463	5,017	43.8
Instrumental	866	258	29.8
Other	10,597	4,759	44.9

GENERAL TABLE 67.—*Monthly death rates, by cause of death, type of feeding, and month of life; infants in eight cities*

Type of feeding and month of life	Infants surviving at beginning of specified month															
	Total	Infant deaths from specified causes														
		All causes		Gastric and intestinal diseases		Respiratory diseases		Malformations		Early infancy		Epidemic and other communicable diseases		Diseases ill defined and unknown		Other causes	
		Number	Per 1,000 survivors[1]	Number	Per 1,000 survivors[1]	Number	Per 1,000 survivors	Number	Per 1,000 survivors	Number	Per 1,000 survivors[1]	Number	Per 1,000 survivors	Number	Per 1,000 survivors	Number	Per 1,000 survivors
First month	22,967	1,028	44.8	69	3.0	66	2.9	76	3.3	697	30.3	24	1.0	26	1.1	70	3.0
Breast	19,438	329	16.9	41	2.1	50	2.6	17	.9	155	8.0	16	.8	8	.4	42	2.2
Partly breast	686	25	36.4	6	8.7			2	2.9	16	23.3					1	1.5
Artificial	2,287	125	54.7	19	8.3	12	5.2	10	4.4	72	31.5	4	1.7	1	.4	7	3.1
Not fed, died at once	545	545	1,000.0	3	5.5	4	7.3	47	86.2	450	825.7	4	7.3	17	31.2	20	36.7
Not reported	11	4								4							
Second month	21,939	204	9.3	63	2.9	45	2.1	3	.1	50	2.3	17	.8	4	.2	22	1.0
Breast	17,178	100	5.8	22	1.3	32	1.9	2	.1	16	.9	13	.8	4	.2	11	.6
Partly breast	1,294	19	14.7	7	5.4	5	3.9			5	3.9					2	1.5
Artificial	3,457	85	24.6	34	9.8	8	2.3	1	.3	29	8.4	4	1.2			9	2.6
Not reported	10																
Third month	21,735	175	8.1	81	3.7	38	1.7	6	.3	17	.8	13	.6	9	.4	11	.5
Breast	15,509	58	3.7	19	1.2	20	1.3	1	.1	3	.2	8	.5	4	.3	3	.2
Partly breast	1,786	23	12.9	13	7.3	6	3.4			2	1.1	1	.6			1	.6
Artificial	4,431	94	21.2	49	11.1	12	2.7	5	1.1	12	2.7	4	.9	5	1.1	7	1.6
Not reported	9																
Fourth month	21,560	173	8.0	75	3.5	46	2.1	5	.2	18	.8	12	.6	3	.1	14	.6
Breast	13,516	46	3.4	9	.7	21	1.6	2	.1	3	.2	6	.4	2	.1	3	2
Partly breast	2,668	24	9.0	11	4.1	6	2.2			3	1.1	2	.7			2	
Artificial	5,366	103	19.2	55	10.2	19	3.5	3	.6	12	2.2	4	.7	1	.2	9	1.7
Not reported	10																
Fifth month	21,387	165	7.7	79	3.7	33	1.5	1	(2)	13	.6	11	.5	3	.1	25	1.2
Breast	12,263	40	3.3	10	.8	14	1.1			1	.1	6	.5			9	.7
Partly breast	3,317	19	5.7	11	3.3	4	1.2							1	.3	3	.9
Artificial	5,797	105	18.1	57	9.8	15	2.6	1	.2	12	2.1	5	.9	2	.3	13	2.2
Not reported	10	1		1													

Sixth month	21,222	156	7.4	81	3.8	33	1.6	4	.2	14	.7	7	.3	2	.1	15	.7
Breast	10,969	23	2.1	7	.6	9	.8	1	.1	2	.2	2	.2			2	.2
Partly breast	4,098	24	5.9	12	2.9	5	1.2			2	.5	1	.2			4	1.0
Artificial	6,145	109	17.7	62	10.1	19	3.1	3	.5	10	1.6	4	.7	2	.3	9	1.5
Not reported	10																
Seventh month	21,066	132	6.3	71	3.4	33	1.6			7	.3	7	.3	2	.1	12	.6
Breast	8,641	16	1.9	3	.3	7	.8			1	.1					5	.6
Partly breast	5,801	23	4.0	9	1.6	11	1.9									3	.5
Artificial	6,615	93	14.1	59	8.9	15	2.3			6	.9	7	1.1	2	.3	4	.6
Not reported	9																
Eighth month	20,934	122	5.8	51	2.4	41	2.0	1	(2)	5	.2	15	.7	1	(2)	8	.4
Breast	7,343	21	2.9	4	.5	11	1.5					3	.4			3	.4
Partly breast	6,671	22	3.3	10	1.5	8	1.2					2	.3	1	.1	1	.1
Artificial	6,911	78	11.3	36	5.2	22	3.2	1	.1	5	.7	10	1.4			4	.6
Not reported	9	1		1													
Ninth month	20,812	119	5.7	48	2.3	36	1.7	1	(2)	3	.1	17	.8	2	.1	12	.6
Breast	5,853	19	3.2	5	.9	7	1.2			1	.2	4	.7			2	.3
Partly breast	7,684	22	2.9	7	.9	8	1.0					3	.4	1	.1	3	.4
Artificial	7,268	78	10.7	36	5.0	21	2.9	1	.1	2	.3	10	1.4	1	.1	7	1.0
Not reported	7																
Tenth month	20,693	109	5.3	53	2.6	29	1.4	2	.1	1	(2)	13	.6	2	.1	9	.4
Breast	4,248	16	3.8	3	.7	6	1.4	1	.2			5	1.2			1	.2
Partly breast	8,591	20	2.3	10	1.2	6	.7					1	.1			3	.3
Artificial	7,845	73	9.3	40	5.1	17	2.2	1	.1	1	.1	7	.9	2	.3	5	.6
Not reported	9																
Eleventh month	20,584	80	3.9	36	1.7	25	1.2			1	(2)	10	.5	2	.1	6	.3
Breast	3,278	8	2.4	4	1.2	2	.6					1	.3			1	.3
Partly breast	9,062	23	2.5	8	.9	9	1.0					4	.4	1	.1	1	.1
Artificial	8,235	49	6.0	24	2.9	14	1.7			1	.1	5	.6	1	.1	4	.5
Not reported	9																
Twelfth month	20,504	92	4.5	36	1.8	25	1.2			4	.2	16	.8	2	.1	9	.4
Breast	2,736	12	4.4	3	1.1	7	2.6									2	.7
Partly breast	9,145	25	2.7	9	1.0	7	.8			1	.1	6	.7	1	.1	1	.1
Artificial	8,616	55	6.4	24	2.8	11	1.3			3	.3	10	1.2	1	.1	6	.7
Not reported	7																

[1] Not shown where base is less than 100.
[2] Less than one-tenth of 1 per cent.

GENERAL TABLE 68.—*Monthly death rates of infants artificially fed, by month of life in which artificial feeding began; infants artificially fed in eight cities*

Month of life	Infants artificially fed								
	Survivors at beginning of month	Deaths during month		Months of life in which artificial feeding began					
				First			Second		
		Number	Per 1,000 survivors	Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month	
					Number	Per 1,000 survivors		Number	Per 1,000 survivors
First	2,266	125	55.2	2,266	125	55.2			
Second	3,435	85	24.7	2,141	72	33.6	1,294	13	10.0
Third	4,419	94	21.3	2,069	54	26.1	1,281	27	21.1
Fourth	5,359	103	19.2	2,015	60	29.8	1,254	25	19.9
Fifth	5,789	105	18.1	1,955	47	24.0	1,229	23	18.7
Sixth	6,139	109	17.8	1,908	36	18.9	1,206	22	18.2
Seventh	6,609	93	14.1	1,872	37	19.8	1,184	23	19.4
Eighth	6,907	78	11.3	1,835	18	9.8	1,161	21	18.1
Ninth	7,262	78	10.7	1,817	26	14.3	1,140	18	15.8
Tenth	7,842	73	9.3	1,791	25	14.0	1,122	7	6.2
Eleventh	8,233	50	6.1	1,766	12	6.8	1,115	12	10.8
Twelfth	8,168	54	6.3	1,754	23	13.1	1,103	5	4.5

Month of life	Infants artificially fed—Continued								
	Months of life in which artificial feeding began—Continued								
	Third			Fourth			Fifth		
	Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month	
		Number	Per 1,000 survivors		Number	Per 1,000 survivors		Number	Per 1,000 survivors
Third	1,069	13	12.2						
Fourth	1,056	17	16.1	1,034	1	1.0			
Fifth	1,039	19	18.3	1,033	14	13.6	533	2	3.8
Sixth	1,020	22	21.6	1,019	22	21.6	531	5	9.4
Seventh	998	8	8.0	997	12	12.0	526	6	11.4
Eighth	990	13	13.1	985	14	14.2	520	4	7.7
Ninth	977	13	13.3	971	11	11.3	516	3	5.8
Tenth	964	9	9.3	960	10	10.4	513	6	11.7
Eleventh	955	7	7.3	950	3	3.2	507	3	5.9
Twelfth	948	6	6.3	947	2	2.1	504	5	9.9

Month of life	Infants artificially fed—Continued											
	Months of life in which artificial feeding began—Continued											
	Sixth			Seventh			Eighth			Ninth and later		
	Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month	
		Number	Per 1,000 survivors		Number	Per 1,000 survivors		Number	Per 1,000 survivors		Number	Per 1,000 survivors
Sixth	455	2	4.4									
Seventh	453	5	11.0	579	2	3.5						
Eighth	448	2	4.5	577	5	8.7	391	1	2.6			
Ninth	446	5	11.2	572	1	1.7	390	1	2.6	433		
Tenth	441	5	11.3	571	7	12.3	389	2	5.1	1,091	2	1.8
Eleventh	436	3	6.9	564	2	3.5	387	2	5.2	1,553	6	3.9
Twelfth	433	5	11.5	562			385			1,982	8	4.0

GENERAL TABLE 69.—*Monthly mortality of infants artificially fed, by month of life in which artificial feeding began; single full-term live births in eight cities to mothers who survived first year of infant's life*

Month of life	Infants artificially fed									
			Months of life in which artificial feeding began							
			First		Second		Third		Fourth	
	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month
First	1,926	62	1,926	62						
Second	3,051	62	1,864	51	1,187	11				
Third	3,966	71	1,813	33	1,176	25	977	13		
Fourth	4,874	86	1,780	50	1,151	20	964	15	979	1
Fifth	5,294	90	1,730	37	1,131	23	949	17	978	12
Sixth	5,632	97	1,693	31	1,108	20	932	20	966	19
Seventh	6,081	77	1,662	26	1,088	21	912	8	947	10
Eighth	6,380	55	1,636	16	1,067	12	904	7	937	10
Ninth	6,737	66	1,620	20	1,055	14	897	12	927	11
Tenth	7,304	64	1,600	20	1,041	5	885	9	916	10
Eleventh	7,691	49	1,580	10	1,036	12	876	7	906	3
Twelfth	8,056	46	1,570	18	1,024	4	869	6	903	2

Month of life	Infants artificially fed—Continued									
	Months of life in which artificial feeding began—Continued									
	Fifth		Sixth		Seventh		Eighth		Ninth and later	
	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month
Fifth	506	1								
Sixth	505	5	428	2						
Seventh	500	6	426	4	546	2				
Eighth	494	3	422	2	544	4	376	1		
Ninth	491	3	420	5	540		375	1	412	
Tenth	488	5	415	4	540	7	374	2	1,045	2
Eleventh	483	4	411	3	533	2	372	2	1,494	6
Twelfth	479	3	408	5	531		370		1,902	8

GENERAL TABLE 70.—*Monthly death rates, by month of life and color and nationality of mother; infants in eight cities*

Color and nationality of mother	Live births	Infant deaths	Infant mortality rates	Monthly death rates											
				First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	22,967	2,555	111.2	44.8	9.3	8.1	8.0	7.7	7.4	6.3	5.8	5.7	5.3	3.9	4.5
White	21,510	2,330	108.3	43.4	9.2	8.0	7.5	7.4	7.0	6.1	5.7	5.7	5.1	3.8	4.4
Native	12,102	1,135	93.8	41.5	7.1	5.8	6.5	5.9	5.7	4.8	4.6	4.9	3.8	3.0	4.0
Foreign born	9,408	1,195	127.0	45.9	11.9	10.9	8.8	9.4	8.8	7.8	7.3	6.8	6.9	4.8	4.8
Italian	1,426	148	103.8	46.3	8.8	11.1	5.3	5.3	6.1	4.6	4.6	3.8	3.9	5.4	3.1
Jewish	1,233	66	53.5	28.4	3.3	3.4	2.5	3.4	.8		3.4	2.5	3.4	1.7	1.7
French-Canadian	1,074	184	171.3	54.0	19.7	16.1	13.3	16.5	10.5	18.1	6.5	13.1	7.7	3.3	6.7
German	776	80	103.1	42.5	9.4	10.9	4.1	4.1	9.7	2.8	7.0	2.8	7.1	1.4	5.7
Polish	1,266	199	157.2	52.1	10.0	16.8	7.7	12.1	10.5	8.8	14.2	7.2	10.0	11.9	7.4
Portuguese	669	134	200.3	40.4	17.1	15.8	27.4	13.2	18.5	29.1	15.8	14.3	16.3	7.4	5.6
Other	2,962	384	129.6	49.6	14.6	8.7	9.1	11.0	10.0	5.6	6.0	7.2	6.5	3.8	5.0
Not reported	2														
Colored	1,457	225	154.4	64.5	11.0	8.2	16.5	12.2	12.3	8.6	7.1	5.5	7.2	5.6	6.5

GENERAL TABLE 71.—*Type of feeding, by color and nationality of mother; months lived from birth to end of ninth by infants in eight cities*

Color and nationality of mother	Months lived from birth to end of ninth							
	Total	Months of exclusively breast feeding		Months of partly breast feeding		Months of artificial feeding		Type of feeding not reported (number)[1]
		Number	Per cent	Number	Per cent	Number	Per cent	Months
Total	192,212.5	110,384.0	57.4	33,904.5	17.6	47,842.0	24.9	82.0
White	180,397.5	103,909.0	57.6	30,890.0	17.1	45,516.5	25.2	82.0
Native	102,285.5	57,514.5	56.2	15,785.5	15.4	28,962.0	28.3	23.5
Foreign born	78,112.0	46,394.5	59.4	15,104.5	19.3	16,554.5	21.1	58.5
Italian	11,943.0	8,193.0	68.6	2,187.0	18.3	1,563.0	13.1	
Jewish	10,688.0	6,570.5	61.5	2,894.5	27.1	1,207.0	11.3	16.0
French-Canadian	8,666.0	3,704.0	42.7	1,148.5	13.3	3,813.5	44.0	
German	6,514.0	3,683.0	56.5	1,433.5	22.0	1,405.5	21.5	2.0
Polish	10,391.5	6,850.5	65.9	2,363.0	22.7	1,155.5	11.1	22.5
Portuguese	5,410.5	2,639.5	48.8	1,045.0	19.3	1,725.5	31.9	
Other	24,471.0	14,749.0	60.3	4,027.0	16.5	5,677.5	23.2	18.0
Not reported	18.0	5.0	27.8	6.0	33.3	7.0	38.9	
Colored	11,815.0	6,475.0	54.8	3,014.5	25.5	2,325.5	19.7	

[1] Per cent not shown for "not reported" group because not significant.

GENERAL TABLE 72.—*Prevalence of breast and artificial feeding, by month of infant's life and color and nationality of mother; infants in eight cities*

Month of infant's life and color and nationality of mother	Infants surviving at beginning of each specified month						
	Total[1]	Breast fed during month		Partly breast fed during month		Artificially fed during month	
		Number	Per cent	Number	Per cent	Number	Per cent
White:							
First	21,008	18,162	86.5	646	3.1	2,189	10.4
Second	20,576	16,106	78.3	1,162	5.6	3,298	16.0
Third	20,387	14,567	71.5	1,586	7.8	4,225	20.7
Fourth	20,223	12,722	62.9	2,385	11.8	5,106	25.2
Fifth	20,072	11,557	57.6	2,986	14.9	5,519	27.5
Sixth	19,923	10,348	51.9	3,717	18.7	5,848	29.4
Seventh	19,783	8,194	41.4	5,298	26.8	6,282	31.8
Eighth	19,662	6,976	35.5	6,122	31.1	6,555	33.3
Ninth	19,549	5,570	28.5	7,078	36.2	6,894	35.3
Tenth	19,437	4,064	20.9	7,930	40.8	7,434	38.2
Eleventh	19,337	3,148	16.3	8,373	43.3	7,807	40.4
Twelfth	19,264	2,634	13.7	8,446	43.8	8,177	42.4
Native—							
First	11,815	10,107	85.5	314	2.7	1,389	11.8
Second	11,600	8,856	76.3	589	5.1	2,152	18.6
Third	11,518	7,995	69.4	758	6.6	2,763	24.0
Fourth	11,451	6,951	60.7	1,179	10.3	3,318	29.0
Fifth	11,377	6,335	55.7	1,491	13.1	3,548	31.2
Sixth	11,310	5,737	50.7	1,851	16.4	3,719	32.9
Seventh	11,246	4,585	40.8	2,699	24.0	3,960	35.2
Eighth	11,192	3,924	35.1	3,182	28.4	4,084	36.5
Ninth	11,141	3,145	28.2	3,756	33.7	4,238	38.0
Tenth	11,086	2,227	20.1	4,318	39.0	4,538	40.9
Eleventh	11,044	1,638	14.8	4,670	42.3	4,733	42.9
Twelfth	11,011	1,304	11.8	4,787	43.5	4,918	44.7

GENERAL TABLE 72.—*Prevalence of breast and artificial feeding, by month of infant's life and color and nationality of mother; infants in eight cities*—Con.

Month of infant's life and color and nationality of mother	Infants surviving at beginning of each specified month						
	Total	Breast fed during month		Partly breast fed during month		Artificially fed during month	
		Number	Per cent	Number	Per cent	Number	Per cent
White—Continued.							
Foreign born—							
First	9,193	8,055	87.6	332	3.6	800	8.7
Second	8,976	7,250	80.8	573	6.4	1,146	12.8
Third	8,869	6,572	74.1	828	9.3	1,462	16.5
Fourth	8,772	5,771	65.8	1,206	13.7	1,788	20.4
Fifth	8,695	5,222	60.1	1,495	17.2	1,971	22.7
Sixth	8,613	4,611	53.5	1,866	21.7	2,129	24.7
Seventh	8,537	3,609	42.3	2,599	30.4	2,322	27.2
Eighth	8,470	3,052	36.0	2,940	34.7	2,471	29.2
Ninth	8,408	2,425	28.8	3,322	39.5	2,656	31.6
Tenth	8,351	1,837	22.0	3,612	43.3	2,896	34.7
Eleventh	8,293	1,510	18.2	3,703	44.7	3,074	37.1
Twelfth	8,253	1,330	16.1	3,659	44.3	3,259	39.5
Italian—							
First	1,390	1,284	92.4	46	3.3	60	4.3
Second	1,360	1,206	88.7	66	4.9	88	6.5
Third	1,348	1,133	84.1	103	7.6	112	8.3
Fourth	1,333	1,042	78.2	145	10.9	146	11.0
Fifth	1,326	964	72.7	192	14.5	170	12.8
Sixth	1,319	854	64.7	262	19.9	203	15.4
Seventh	1,311	700	53.4	382	29.1	229	17.5
Eighth	1,305	574	44.0	461	35.3	270	20.7
Ninth	1,299	466	35.9	536	41.3	297	22.9
Tenth	1,294	368	28.4	590	45.6	336	26.0
Eleventh	1,289	299	23.2	620	48.1	370	28.7
Twelfth	1,282	275	21.5	617	48.1	390	30.4
Jewish—							
First	1,213	1,130	93.2	45	3.7	37	3.1
Second	1,198	1,039	86.7	91	7.6	67	5.6
Third	1,194	966	80.9	139	11.6	88	7.4
Fourth	1,190	831	69.8	232	19.5	125	10.5
Fifth	1,187	758	63.9	284	23.9	143	12.0
Sixth	1,183	671	56.7	356	30.1	153	12.9
Seventh	1,182	492	41.6	509	43.1	178	15.1
Eighth	1,182	402	34.0	579	49.0	198	16.8
Ninth	1,178	292	24.8	662	56.2	223	18.9
Tenth	1,175	216	18.4	704	59.9	254	21.6
Eleventh	1,171	172	14.7	708	60.5	290	24.8
Twelfth	1,169	137	11.7	714	61.1	318	27.2
French-Canadian—							
First	1,040	805	77.4	37	3.6	198	19.0
Second	1,016	681	67.0	56	5.5	279	27.5
Third	996	557	55.9	86	8.6	353	35.4
Fourth	980	440	44.9	118	12.0	422	43.1
Fifth	967	370	38.3	132	13.7	465	48.1
Sixth	951	305	32.1	158	16.6	488	51.3
Seventh	941	231	24.5	181	19.2	529	56.2
Eighth	924	191	20.7	186	20.1	547	59.2
Ninth	918	141	15.4	202	22.0	575	62.6
Tenth	906	110	12.1	195	21.5	600	66.2
Eleventh	899	84	9.3	184	20.5	630	70.1
Twelfth	896	75	8.4	168	18.8	652	72.8
German—							
First	762	646	84.8	38	5.0	77	10.1
Second	743	569	76.6	70	9.4	103	13.9
Third	736	509	69.2	88	12.0	139	18.9
Fourth	728	452	62.1	114	15.7	162	22.3
Fifth	725	406	56.0	147	20.3	172	23.7
Sixth	722	363	50.3	177	24.5	182	25.2
Seventh	715	296	41.4	234	32.7	185	25.9
Eighth	713	255	35.8	263	36.9	195	27.3
Ninth	708	198	28.0	305	43.1	205	29.0
Tenth	706	131	18.6	339	48.0	236	33.4
Eleventh	701	95	13.6	349	49.8	257	36.7
Twelfth	700	74	10.6	345	49.3	281	40.1

GENERAL TABLE 72.—*Prevalence of breast and artificial feeding, by month of infant's life and color and nationality of mother; infants in eight cities*—Con.

Month of infant's life and color and nationality of mother	Infants surviving at beginning of each specified month						
	Total	Breast fed during month		Partly breast fed during month		Artificially fed during month	
		Number	Per cent	Number	Per cent	Number	Per cent
White—Continued.							
Foreign born—Continued.							
Polish—							
First	1,238	1,137	91.8	41	3.3	58	4.7
Second	1,200	1,041	86.8	79	6.6	77	6.4
Third	1,188	979	82.4	107	9.0	98	8.2
Fourth	1,168	884	75.7	167	14.3	114	9.8
Fifth	1,159	807	69.6	222	19.2	127	11.0
Sixth	1,145	712	62.2	281	24.5	150	13.1
Seventh	1,133	534	47.1	430	38.0	167	14.7
Eighth	1,123	447	39.8	494	44.0	180	16.0
Ninth	1,107	343	31.0	557	50.3	205	18.5
Tenth	1,099	273	24.8	592	53.9	232	21.1
Eleventh	1,088	225	20.7	614	56.4	247	22.7
Twelfth	1,075	188	17.5	610	56.7	275	25.6
Portuguese—							
First	657	530	80.7	51	7.8	76	11.6
Second	642	455	70.9	73	11.4	114	17.8
Third	631	376	59.6	100	15.8	155	24.6
Fourth	621	292	47.0	125	20.1	204	32.9
Fifth	604	257	42.5	129	21.4	218	36.1
Sixth	596	234	39.3	134	22.5	228	38.3
Seventh	585	187	32.0	148	25.3	250	42.7
Eighth	568	172	30.3	145	25.5	251	44.2
Ninth	559	148	26.5	150	26.8	261	46.7
Tenth	551	125	22.7	160	29.0	266	48.3
Eleventh	542	122	22.5	156	28.8	264	48.7
Twelfth	538	114	21.2	148	27.5	276	51.3
Other—							
First	2,891	2,521	87.2	74	2.6	294	10.2
Second	2,815	2,257	80.2	138	4.9	418	14.8
Third	2,774	2,051	73.9	205	7.4	516	18.6
Fourth	2,750	1,830	66.5	304	11.1	614	22.3
Fifth	2,725	1,660	60.9	388	14.2	675	24.8
Sixth	2,695	1,472	54.6	497	18.4	724	26.9
Seventh	2,668	1,169	43.8	714	26.8	783	29.3
Eighth	2,653	1,011	38.1	811	30.6	829	31.2
Ninth	2,637	837	31.7	909	34.5	889	33.7
Tenth	2,618	614	23.5	1,031	39.4	971	37.1
Eleventh	2,601	513	19.7	1,071	41.2	1,015	39.0
Twelfth	2,591	467	18.0	1,056	40.8	1,066	41.1
Nationality not reported—							
First	2	2					
Second	2	2					
Third	2	1				1	
Fourth	2			1		1	
Fifth	2			1		1	
Sixth	2			1		1	
Seventh	2			1		1	
Eighth	2			1		1	
Ninth	2			1		1	
Tenth	2			1		1	
Eleventh	2			1		1	
Twelfth	2			1		1	
Colored:							
First	1,414	1,276	90.2	40	2.8	98	6.9
Second	1,363	1,072	78.7	132	9.7	159	11.7
Third	1,348	942	69.9	200	14.8	206	15.3
Fourth	1,337	794	59.4	283	21.2	260	19.4
Fifth	1,315	706	53.7	331	25.2	278	21.1
Sixth	1,299	621	47.8	381	29.3	297	22.9
Seventh	1,283	447	34.8	503	39.2	333	26.0
Eighth	1,272	367	28.9	549	43.2	356	28.0
Ninth	1,263	283	22.4	606	48.0	374	29.6
Tenth	1,256	184	14.6	661	52.6	411	32.7
Eleventh	1,247	130	10.4	689	55.3	428	34.3
Twelfth	1,240	102	8.2	699	56.4	439	35.4

[1] Excluding those who died not fed.

GENERAL TABLE 73.—*Monthly death rates, by color and nationality of mother and by month of life and type of feeding; infants in eight cities*

Type of feeding and month of life	Monthly death rates [1]											
	Total	Color and nationality of mother										
		White										Colored
		Total	Native	Foreign born								
				Total	Italian	Jewish	French-Canadian	German	Polish	Portuguese	Other	
First	44.8	43.4	41.5	45.9	46.3	28.4	54.0	42.5	52.1	40.4	49.6	64.5
Breast	16.9	16.2	14.0	19.0	19.5	9.7	13.7	20.1	25.5	13.2	22.6	26.6
Partly breast	36.4	34.1	44.6	24.1	21.7	------	54.1	------	24.4	19.6	40.5	75.0
Artificial	54.7	50.7	40.3	68.8	66.7	81.1	55.6	77.9	137.9	92.1	54.4	42.9
Second	9.3	9.2	7.1	11.9	8.8	3.3	19.7	9.4	10.0	17.1	14.6	11.0
Breast	5.8	5.7	3.6	8.3	8.3	2.9	13.2	10.5	8.7	8.9	8.4	7.5
Partly breast	14.7	15.5	11.9	19.2	------	11.0	17.9	14.3	------	54.5	29.0	7.6
Artificial	24.6	24.0	20.0	31.4	22.7	------	35.8	------	39.0	26.3	43.1	37.7
Third	8.1	8.0	5.8	10.9	11.1	3.4	16.1	10.9	16.8	15.8	8.7	8.2
Breast	3.7	3.7	1.8	6.1	7.1	2.1	10.8	------	10.2	8.0	5.4	4.2
Partly breast	12.9	13.2	7.9	18.1	19.4	------	23.3	34.1	46.7	--------	14.6	10.0
Artificial	21.2	21.1	17.0	28.7	44.6	22.7	22.7	36.0	51.0	45.2	19.4	24.3
Fourth	8.0	7.5	6.5	8.8	5.3	2.5	13.3	4.1	7.7	27.4	9.1	16.5
Breast	3.4	2.9	1.9	4.2	1.9	1.2	9.1	2.2	5.7	13.7	3.8	11.3
Partly breast	9.0	8.4	2.5	14.1	13.8	4.3	16.9	------	17.9	40.0	13.2	14.1
Artificial	19.2	18.4	17.5	20.1	20.5	8.0	17.0	12.3	8.8	39.2	22.8	34.6
Fifth	7.7	7.4	5.9	9.4	5.3	3.4	16.5	4.1	12.1	13.2	11.0	12.2
Breast	3.3	3.2	2.5	4.0	5.2	1.3	2.7	2.5	7.4	3.9	3.6	4.2
Partly breast	5.7	5.4	2.7	8.0	10.4	7.0	15.2	------	22.5	--------	2.6	9.1
Artificial	18.1	17.2	13.2	24.4	------	7.0	28.0	11.6	15.7	32.1	34.1	36.0
Sixth	7.4	7.0	5.7	8.8	6.1	.8	10.5	9.7	10.5	18.5	10.0	12.3
Breast	2.1	1.9	1.6	2.4	2.3	------	3.3	------	1.4	4.3	4.1	4.8
Partly breast	5.9	5.9	3.2	8.6	11.5	------	12.7	5.6	10.7	22.4	8.0	5.2
Artificial	17.7	16.8	13.2	23.1	14.8	6.5	14.3	32.9	53.3	30.7	23.5	37.0
Seventh	6.3	6.1	4.8	7.8	4.6	------	18.1	2.8	8.8	29.1	5.6	8.6
Breast	1.9	1.6	1.1	2.2	5.7	------	4.3	------	1.9	5.3	.9	6.7
Partly breast	4.0	3.8	2.2	5.4	2.6	------	11.0	------	9.3	33.8	2.8	6.0
Artificial	14.1	14.0	10.9	19.4	4.4	------	26.5	10.8	30.0	44.0	15.3	15.0
Eighth	5.8	5.7	4.6	7.3	4.6	3.4	6.5	7.0	14.2	15.8	6.0	7.1
Breast	2.9	2.9	1.3	4.9	3.5	2.5	5.2	------	8.9	5.8	5.9	2.7
Partly breast	3.3	3.3	2.5	4.0	2.2	------	5.4	------	12.1	6.9	3.7	3.6
Artificial	11.3	11.0	9.3	13.8	11.1	10.1	7.3	25.6	33.3	27.9	8.4	16.9
Ninth	5.7	5.7	4.9	6.8	3.8	2.5	13.1	2.8	7.2	14.3	7.2	5.5
Breast	3.2	3.2	1.6	5.4	4.3	6.8	--------	5.1	5.8	6.8	6.0	3.5
Partly breast	2.9	3.0	3.5	2.4	------	1.5	5.0	------	5.4	6.7	2.5	1.7
Artificial	10.7	10.6	8.7	13.6	10.1	------	19.1	4.9	14.6	23.0	13.5	13.4
Tenth	5.3	5.1	3.8	6.9	3.9	3.4	7.7	7.1	10.0	16.3	6.5	7.2
Breast	3.8	3.9	3.1	4.9	5.4	------	--------	7.6	7.3	8.0	4.9	------
Partly breast	2.3	2.1	1.6	2.8	3.4	------	10.3	2.9	3.4	6.3	1.9	4.5
Artificial	9.3	9.0	6.2	13.5	3.0	15.7	8.3	12.7	30.2	26.3	12.4	14.6
Eleventh	3.9	3.8	3.0	4.8	5.4	1.7	3.3	1.4	11.9	7.4	3.8	5.6
Breast	2.4	2.2	.6	4.0	3.3	------	--------	------	4.4	--------	7.8	7.7
Partly breast	2.5	2.5	1.5	3.8	3.2	1.4	--------	2.9	8.1	12.8	2.8	2.9
Artificial	6.0	5.8	5.3	6.5	10.8	3.4	4.8	------	28.3	7.6	3.0	9.3
Twelfth	4.5	4.4	4.0	4.8	3.1	1.7	6.7	5.7	7.4	5.6	5.0	6.5
Breast	4.4	3.8	1.5	6.0	7.3	7.3	26.7	------	5.3	8.8	2.1	19.6
Partly breast	2.7	2.6	2.1	3.3	1.6	------	11.9	2.9	3.3	6.8	4.7	4.3
Artificial	6.4	6.4	6.5	6.1	2.6	3.1	3.1	10.7	18.2	3.6	6.6	6.8

[1] Not shown where base is less than 100.

GENERAL TABLE 74.—*Relative mortality, by nationality of mother, for infants not fed and for infants receiving each type of feeding; eight cities*

Nationality of mother	Deaths of infants not fed			Deaths of infants fed in each specified way					
				Total			Breast fed		
	Actual	Expected [1]	Ratio of actual to expected (per cent)	Actual	Expected [2]	Ratio of actual to expected (per cent)	Actual	Expected	Ratio of actual to expected (per cent)
Total	545	545.0	100.0	2,010	2,010.0	100.0	688	687.9	100.0
White	502	510.4	98.4	1,828	1,893.9	96.5	619	646.0	95.8
Native	287	287.2	99.9	848	1,116.4	76.0	251	356.9	70.3
Foreign born	215	223.2	96.3	980	777.5	126.0	368	289.1	127.3
Italian	36	33.8	106.5	112	100.9	111.0	65	49.3	131.8
Jewish	20	29.3	68.3	46	89.5	51.4	22	40.3	54.6
French-Canadian	34	25.5	133.3	150	118.4	126.7	36	25.4	141.7
German	14	18.4	76.1	66	66.5	99.2	23	22.7	101.3
Polish	28	30.0	93.3	171	87.4	195.7	71	41.9	169.5
Portuguese	12	15.9	75.5	122	64.6	188.9	25	17.9	139.7
Other	71	70.3	101.0	313	250.0	125.2	126	91.6	137.6
Not reported					.2				
Colored	43	34.6	124.3	182	116.1	156.8	69	41.9	164.7

Nationality of mother	Deaths of infants fed in each specified way—Continued								
	Partly breast fed			Artificially fed			Type of feeding not reported		
	Actual	Expected	Ratio of actual to expected (per cent)	Actual	Expected	Ratio of actual to expected (per cent)	Actual	Expected	Ratio of actual to expected (per cent)
Total	269	269.1	100.0	1,047	1,047.0	100.0	6	6.1	100.0
White	240	245.7	97.7	963	996.2	96.7	6	6.1	100.0
Native	91	126.8	71.8	503	630.4	79.8	3	2.3	130.4
Foreign born	149	118.9	125.3	460	365.8	125.8	3	3.8	78.9
Italian	17	17.1	99.4	30	34.6	86.7			
Jewish	6	21.8	27.5	16	26.5	60.4	2	.9	222.2
French-Canadian	19	9.3	204.3	95	83.6	113.6			
German	8	11.7	68.4	35	31.7	110.4		.4	
Polish	39	18.0	216.7	60	26.3	228.1	1	1.3	76.9
Portuguese	24	9.6	250.0	73	37.1	196.8			
Other	36	31.4	114.6	151	125.9	119.9		1.2	
Not reported					.1				
Colored	29	23.4	123.9	84	50.8	165.4			

[1] Expected at average rate for infants not fed.
[2] Expected at average rate for infants receiving the same type of feeding.

GENERAL TABLE 75.—*Color and nationality of mother, by average number of persons per room; infants in seven cities who survived two weeks* [1]

Color and nationality of mother	Infants who survived two weeks [1]					
	Total	Average number of persons per room				
		Less than one	One, less than two	Two, less than three	Three and over	Not reported
Total	20,698	10,837	8,558	1,040	132	131
White	19,337	10,218	7,877	998	120	124
Native	10,896	7,286	3,396	168	14	32
Foreign born	8,441	2,932	4,481	830	106	92
Italian	1,303	311	779	194	14	5
Jewish	1,186	491	608	85	2	----
French-Canadian	1,026	415	551	53	2	5
German	707	343	326	28	6	4
Polish	1,119	140	637	239	47	56
Portuguese	652	179	390	65	6	12
Other	2,446	1,052	1,189	166	29	10
Not reported	2	1	1	----	----	----
Colored	1,361	619	681	42	12	7

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).

GENERAL TABLE 76.—*Earnings of father, by color and nationality of mother; live births in seven cities*

Earnings of father	Live births—											
	Total	To white mothers										To colored mothers
		Total	Native	Foreign born								
				Total	Italian	Jewish	French-Canadian	German	Polish	Portuguese	Other	Not reported	
Total	21,536	20,085	11,323	8,762	1,355	1,223	1,074	729	1,167	669	2,543	2	1,451
Less than $450	3,085	2,538	653	1,885	441	210	75	84	408	267	400	----	547
$450–$549	2,827	2,430	926	1,504	298	162	180	79	264	164	357	----	397
$550–$649	2,908	2,737	1,390	1,347	198	144	197	130	224	89	365	----	171
$650–$849	5,050	4,904	2,914	1,990	221	253	358	211	160	95	691	1	146
$850–$1,049	3,345	3,303	2,291	1,012	98	167	159	117	56	30	385	----	42
$1,050–$1,249	1,391	1,377	1,070	307	28	58	28	37	11	4	140	1	14
$1,250 and over	2,252	2,237	1,770	467	33	169	54	55	9	5	142	----	15
No earnings	313	239	128	111	18	28	12	7	18	5	23	----	74
Not reported	365	320	181	139	20	32	11	9	17	10	40	----	45

GENERAL TABLE 77.—*Average per capita income from father's earnings, by color and nationality of mother; live births in seven cities* [1]

Color and nationality of mother	Live births [1]					
	Total	Average per capita income from father's earnings				
		Less than $50	$50–$99	$100–$199	$200–$399	$400 and over
Total	18,587	227	2,948	6,900	8,000	512
White	17,273	203	2,580	6,268	7,716	506
Native	9,238	49	746	2,859	5,161	423
Foreign born	8,035	154	1,834	3,409	2,555	83
Italian	1,281	24	423	556	267	11
Jewish	993	20	210	419	333	11
French-Canadian	997	30	219	393	352	3
German	657	15	115	252	255	20
Polish	1,106	28	324	522	231	1
Portuguese	664	21	176	334	133	----
Other	2,336	16	367	933	984	36
Not reported	1	----	----	----	----	1
Colored	1,314	24	368	632	284	6

[1] Excluding live births in families with father's earnings $1,250 and over, earnings not reported, and no father's earnings, a few cases in which number in family was not reported, and those in which infant lived in an institution.

GENERAL TABLE 78.—*Monthly death rates, by month of life and average number of persons per room; infants in seven cities who survived two weeks* [1]

Month of life	Infant survivors at beginning of specified month	Deaths during month		Average number of persons per room											
				Less than 1			1, less than 2			2 and over			Not reported		
		Number	Rate	Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month		Survivors at beginning of month	Deaths during month	
					Number	Rate		Number	Rate		Number	Rate		Number	Rate
First [2]	[2] 20,698	172	8.3	10,837	72	6.6	8,558	78	9.1	1,172	20	17.1	131	2	15.3
Second	20,526	184	9.0	10,765	65	6.0	8,480	102	12.0	1,152	14	12.2	129	3	23.3
Third	20,342	157	7.7	10,700	50	4.7	8,378	86	10.3	1,138	19	16.7	126	2	15.9
Fourth	20,185	154	7.6	10,650	67	6.3	8,292	67	8.1	1,119	13	11.6	124	7	56.5
Fifth	20,031	148	7.4	10,583	54	5.1	8,225	79	9.6	1,106	14	12.7	117	1	8.5
Sixth	19,883	150	7.5	10,529	42	4.0	8,146	86	10.6	1,092	19	17.4	116	3	25.9
Seventh	19,733	125	6.3	10,487	43	4.1	8,060	66	8.2	1,073	15	14.0	113	1	8.8
Eighth	19,608	105	5.4	10,444	40	3.8	7,994	54	6.8	1,058	10	9.5	112	1	8.9
Ninth	19,503	110	5.6	10,404	40	3.8	7,940	60	7.6	1,048	7	6.7	111	3	27.0
Tenth	19,393	105	5.4	10,364	39	3.8	7,880	55	7.0	1,041	10	9.6	108	1	9.3
Eleventh	19,288	70	3.6	10,325	25	2.4	7,825	32	4.1	1,031	9	8.7	107	4	37.4
Twelfth	19,218	86	4.5	10,300	28	2.7	7,793	47	6.0	1,022	9	8.8	103	2	19.4

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).
[2] Surviving at commencement of third week of life; see also note 1.

GENERAL TABLE 79.—*Prevalence of artificial feeding in selected months, by average number of persons per room; infants in seven cities who survived two weeks* [1]

Average number of persons per room	Infants surviving at beginning of third month			Infants surviving at beginning of sixth month			Infants surviving at beginning of ninth month		
	Total	Artificially fed during third month		Total	Artificially fed during sixth month		Total	Artificially fed during ninth month	
		Number	Per cent		Number	Per cent		Number	Per cent
Total	20,342	4,255	20.9	19,883	5,901	29.7	19,503	6,970	35.7
Less than 1	10,700	2,393	22.4	10,529	3,348	31.8	10,404	3,983	38.3
1, less than 2	8,378	1,680	20.1	8,146	2,288	28.1	7,940	2,681	33.8
2, less than 3	1,012	144	14.2	973	212	21.8	934	246	26.3
3 and over	126	13	10.3	119	23	19.3	114	26	22.8
Not reported	126	25	19.8	116	30	25.9	111	34	30.6

[1] Excluding a small number of infants who lived less than two weeks in dwelling of residence (Baltimore).

GENERAL TABLE 80.—*Earnings of father, by average number of persons per room; infants in seven cities who survived two weeks* [1]

Earnings of father	Infants who survived two weeks [1]					
	Total	Average number of persons per room				
		Less than 1	1, less than 2	2, less than 3	3 and over	Not reported
Total	20,698	10,837	8,558	1,040	132	131
Less than $450	2,943	772	1,703	373	48	47
$450–$549	2,719	994	1,449	224	29	23
$550–$649	2,799	1,184	1,402	165	22	26
$650–$849	4,856	2,654	2,022	148	19	13
$850–$1,049	3,229	2,184	968	65	5	7
$1,050–$1,249	1,347	991	340	12	1	3
$1,250 and over	2,173	1,788	369	11	1	4
No earnings	291	96	157	30	3	5
Not reported	341	174	148	12	4	3

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore).

GENERAL TABLE 81.—*Average number of persons per room, by per capita income from father's earnings; infants in seven cities who survived two weeks* [1]

Per capita income from father's earnings	Infants who survived two weeks [1]					
	Total	Average number of persons per room				
		Less than 1	1, less than 2	2, less than 3	3 and over	Not reported
Total	17,874	8,772	7,875	985	124	118
Less than $50	218	----	133	81	4	----
$50–$99	2,831	280	2,005	463	72	11
$100–$199	6,652	2,407	3,811	342	35	57
$200–$399	7,678	5,639	1,883	95	13	48
$400 and over	495	446	43	4	----	2

[1] Excluding a small number of infants who did not live two weeks in dwelling of residence (Baltimore). Excluding also infants in the "$1,250 and over," "no earnings," and "earnings not reported" groups, and those for whom the number in family was not reported.

GENERAL TABLE 82.—*Monthly death rates, by month of infant's life and employment of mother during pregnancy; infants in eight cities*

Employment of mother during pregnancy	Live births	Infant deaths	Infant mortality rates	Monthly death rates											
				First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	22,967	2,555	111.2	44.8	9.3	8.1	8.0	7.7	7.4	6.3	5.8	5.7	5.3	3.9	4.5
Employed away from home	3,084	543	176.1	63.2	15.6	14.1	14.6	12.3	13.9	13.7	9.4	10.7	9.2	5.8	8.2
Employed at home	3,788	434	114.6	36.7	11.0	9.1	10.1	8.8	7.4	7.8	7.8	6.4	6.5	5.0	4.2
Not employed	16,089	1,576	98.0	43.1	7.7	6.7	6.3	6.6	6.1	4.6	4.7	4.6	4.3	3.3	3.9
Not reported	6	2													

GENERAL TABLE 83.—*Proportion of plural births, by employment of mother during pregnancy; live births in eight cities*

Employment of mother during pregnancy	Live births		
	Total	Plural births	
		Number	Per 1,000 live births
Total	22,967	529	23.0
Employed away from home	3,084	71	23.0
Employed at home	3,788	91	24.0
Not employed	16,089	367	22.8
Not reported	6		

GENERAL TABLE 84.—*Prevalence of artificial feeding, by month of life and employment of mother during pregnancy; infants in eight cities*

Employment of mother during pregnancy	Infants surviving at beginning of third month			Infants surviving at beginning of sixth month			Infants surviving at beginning of ninth month		
	Total	Artificially fed during third month		Total	Artificially fed during sixth month		Total	Artificially fed during ninth month	
		Number	Per cent		Number	Per cent		Number	Per cent
Total	21,735	4,431	20.4	21,222	6,145	29.0	20,812	7,268	34.9
Away from home	2,844	630	22.2	2,729	911	33.4	2,629	1,060	40.3
At home	3,609	603	16.7	3,509	849	24.2	3,429	1,063	31.0
Not employed	15,276	3,197	20.9	14,979	4,383	29.3	14,749	5,140	34.8
Employment not reported	6	1	16.7	5	1	20.0	5	5	100.0

GENERAL TABLE 85.—*Employment of mother away from home, by interval between cessation of work and confinement, and earnings of father; live births in seven cities*

Earnings of father	Live births—									
	Total	To mothers employed away from home								
		Total	Per cent	Interval between cessation of work and confinement						
				No interval		Less than 1 month		1 month and over		Not reported	
				Number	Per cent[1]	Number	Per cent[1]	Number	Per cent[1]	Number	Per cent[1]
Total	21,536	3,071	14.3	217	7.1	192	6.3	2,634	85.8	28	0.9
Less than $450	3,085	872	28.3	88	10.1	76	8.7	705	80.8	3	.3
$450–$549	2,827	649	23.0	51	7.9	37	5.7	556	85.7	5	.8
$550–$649	2,908	529	18.2	16	3.0	28	5.3	478	90.4	7	1.3
$650–$849	5,050	547	10.8	13	2.4	20	3.7	506	92.5	8	1.5
$850–$1,049	3,345	202	6.0	11	5.4	5	2.5	185	91.6	1	.5
$1,050–$1,249	1,391	42	3.0	2	------	------	------	39	------	1	------
$1,250 and over	2,252	43	1.9	7	------	2	------	33	------	1	------
No earnings	313	117	37.4	22	18.8	16	13.7	79	67.5	------	------
Not reported	365	70	19.2	7	10.0	8	11.4	53	75.7	2	2.9

[1] Not shown where base is less than 50. Percentages based on live births to mothers employed away from home.

GENERAL TABLE 86.—*Employment of mother during pregnancy, by her employment during first year of infant's life; infants in eight cities*

Employment during first year of infant's life	Live births—			
	Total	To mothers employed away from home during pregnancy	To mothers employed at home during pregnancy	To mothers not employed during pregnancy
Total	22,967	3,084	3,788	16,095
Employed away from home	1,742	1,285	96	361
Employed at home	4,337	424	3,218	695
Not employed	[1]16,887	1,375	474	15,038
Not reported[2]	1	------	------	1

[1] Including 6 cases for which it was not reported whether or not the mother was employed.
[2] Place of employment not reported.

GENERAL TABLE 87.—*Type of feeding in month in which mother went to work, by place of her employment; infants in eight cities surviving when mothers went to work*

Month of infant's life when mother resumed work	Infants whose mothers went to work in specified month								
	Survivors when mothers went to work	Deaths during month	Breast fed during month		Partly breast fed during month		Artificially fed during month		Type of feeding not reported
			Survivors	Deaths during month	Survivors	Deaths during month	Survivors	Deaths during month	Survivors
Mother employed away from home during first year of infant's life	1,742	7	545	1	575	2	618	4	4
First month	105		76		8		21		
Second month	243		107		55		80		1
Third month	233	1	99		63	1	71		
Fourth month	242		73		68		101		
Fifth month	143	1	35		51		57	1	
Sixth month	151	3	44		44		62	3	1
Seventh month	144		31		63		49		1
Eighth month	111	1	22	1	49		40		
Ninth month	138		26		53		59		
Tenth month	99		21		40		38		
Eleventh month	84	1	6		58	1	20		
Twelfth month	46		5		23		18		
Not reported	3						2		1
Mother employed at home during first year of infant's life	4,337	28	3,224	16	488	3	580	9	45
First month	2,428	22	2,141	15	89	2	197	5	1
Second month	629	3	483	1	50	1	96	1	
Third month	278	2	195		34		48	2	1
Fourth month	202		129		34		39		
Fifth month	144		86		29		29		
Sixth month	107		54		26		27		
Seventh month	132		56		41		35		
Eighth month	89		24		41		24		
Ninth month	77		16		40		21		
Tenth month	90	1	18		48		24	1	
Eleventh month	72		9		36		27		
Twelfth month	30		2		20		8		
Not reported	59		11				5		43
Place of mother's employment not reported: Age not reported	1								1

GENERAL TABLE 88.—*Type of feeding, by month of infant's life and place of mother's employment; infants in eight cities whose mothers were employed during some preceding month of infant's life*

Month of infant's life, and place of employment and nationality of mother	Infants whose mothers were employed during some preceding month of infant's life								
	Survivors at beginning of each specified month	Deaths during month	Breast fed during specified month		Partly breast fed during specified month		Artificially fed during specified month		Type of feeding not reported
			Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month	Deaths during month	Survivors at beginning of month
Mother employed away from home during first year of infant's life:									
Second month	105	1	36		22		47	1	
Third month	347	8	79		105	4	162	4	1
Fourth month	571	9	101		186	3	283	6	1
Fifth month	804	15	126	1	259	4	418	10	1
Sixth month	931	25	132	2	300	4	498	19	1
Seventh month	1,054	27	104	1	364	7	584	19	2
Eighth month	1,171	14	102		431	3	635	11	3
Ninth month	1,267	21	81		485	4	698	17	3
Tenth month	1,384	16	68		536	5	775	11	5
Eleventh month	1,467	8	66		569	2	827	6	5
Twelfth month	1,542	17	59	2	611	4	867	11	5
Mother employed at home during first year of infant's life:									
Second month	2,406	27	1,971	13	150	3	284	11	1
Third month	3,005	23	2,226	9	286	4	492	10	1
Fourth month	3,258	27	2,123	5	463	5	670	17	2
Fifth month	3,433	24	2,039	4	623	4	769	16	2
Sixth month	3,553	21	1,901	3	791	3	859	15	2
Seventh month	3,639	22	1,531	7	1,144	5	962	10	2
Eighth month	3,749	27	1,328	7	1,350	5	1,069	15	2
Ninth month	3,811	22	1,067	5	1,565	5	1,177	12	2
Tenth month	3,866	22	839	3	1,725	5	1,300	14	2
Eleventh month	3,933	22	659	5	1,864	5	1,408	12	2
Twelfth month	3,983	17	560	3	1,917	5	1,505	9	1

GENERAL TABLE 89.—*Type of feeding during first nine months of life, by employment of mother; infants in eight cities*

Employment of mother during first year of infant's life	Months lived from birth to end of ninth							
	Total	Months of breast feeding		Months of partly breast feeding		Months of artificial feeding		Feeding not reported (number) [2]
		Number	Per cent	Number	Per cent	Number	Per cent	
Total	192,212.50	110,384.00	57.4	33,904.50	17.60	47,842.00	24.9	82.0
Employed away from home	6,891.00	977.25	14.2	2,360.30	34.25	3,540.00	51.4	13.5
Employed at home	27,585.25	14,680.75	53.2	6,502.25	23.60	6,387.75	23.2	14.5
Not employed [1]	157,736.25	94,726.00	60.1	25,042.00	15.90	37,914.25	24.0	54.0

[1] Including not reported as to employment.
[2] Per cent not shown for "not reported" group because not significant.

GENERAL TABLE 90.—*Earnings of mother, by earnings of father; infants in seven cities whose mothers were employed during first year of infant's life*

Earnings of mother	Live births to mothers employed during first year of infant's life									
	Total	Earnings of father								
		Less than $450	$450–$549	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
Total	6,384	1,697	1,178	880	1,179	610	205	262	220	153
Less than $150	3,077	943	644	439	544	251	76	60	77	43
$150–$249	1,301	390	210	177	237	116	51	28	70	22
$250–$349	692	152	117	93	152	74	29	27	34	14
$350–$549	465	97	100	80	92	45	8	15	21	7
$550 and over	155	25	20	20	39	23	7	12	7	2
Not reported	694	90	87	71	115	101	34	120	11	65

GENERAL TABLE 91.—*Earnings of children in family, by earnings of father; live births in seven cities in families in which one or more children worked during year following the births*

Earnings of children	Live births in families in which one or more children worked									
	Total	Earnings of father								
		Less than $450	$450–$549	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
Total	1,003	241	128	158	199	123	55	56	18	25
Less than $50	84	32	8	19	11	4	3	4	----	3
$50–$149	133	38	19	18	26	12	10	6	3	1
$150–$249	144	34	22	22	32	14	7	9	2	2
$250–$349	133	41	14	20	23	11	9	9	4	2
$350 and over	421	79	57	69	89	69	22	21	7	8
Not reported	88	17	8	10	18	13	4	7	2	9

96515°—25†——16

GENERAL TABLE 92.—*Infant mortality rates, by total annual income of family and earnings of father; live births in seven cities*

Earnings of father	Total	Total annual income of family: Less than $550	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
	LIVE BIRTHS								
Total	21,536	4,281	2,739	5,134	3,787	1,903	3,039	60	593
Less than $450	3,085	2,364	281	253	68	28	42	-------	49
$450–$549	2,827	1,713	450	379	153	50	46	-------	36
$550–$649	2,908	-------	2,000	525	194	79	72	-------	38
$650–$849	5,050	-------	-------	3,965	613	237	182	-------	53
$850–$1,049	3,345	-------	-------	-------	2,752	322	245	-------	26
$1,050–$1,249	1,391	-------	-------	-------	-------	1,183	198	-------	10
$1,250 and over	2,252	-------	-------	-------	-------	-------	2,240	-------	12
No earnings	313	202	8	12	5	2	7	60	17
Not reported	365	2	-------	-------	2	2	7	-------	352
	INFANT DEATHS								
Total	2,368	587	321	601	359	152	236	7	105
Less than $450	515	354	46	66	17	7	8	-------	17
$450–$549	355	184	60	60	23	6	15	-------	7
$550–$649	339	-------	213	75	32	5	6	-------	8
$650–$849	543	-------	-------	396	77	30	30	-------	10
$850–$1,049	277	-------	-------	-------	210	32	31	-------	4
$1,050–$1,249	89	-------	-------	-------	-------	72	14	-------	3
$1,250 and over	133	-------	-------	-------	-------	-------	132	-------	1
No earnings	66	49	2	4	-------	-------	-------	7	4
Not reported	51	-------	-------	-------	-------	-------	-------	-------	51
	INFANT MORTALITY RATES								
Total	110.0	137.1	117.2	117.1	94.8	79.9	77.7	116.7	177.1
Less than $450	166.9	149.7	163.7	260.9	250.0	(1)	(1)	-------	(1)
$450–$549	125.6	107.4	133.3	158.3	150.3	120.0	(1)	-------	(1)
$550–$649	116.6	-------	106.5	142.9	164.9	63.3	83.3	-------	(1)
$650–$849	107.5	-------	-------	99.9	125.6	126.6	164.8	-------	188.7
$850–$1,049	82.8	-------	-------	-------	76.3	99.4	126.5	-------	(1)
$1,050–$1,249	64.0	-------	-------	-------	-------	60.9	70.7	-------	(1)
$1,250 and over	59.1	-------	-------	-------	-------	-------	58.9	-------	(1)
No earnings	210.9	242.6	(1)	(1)	-------	-------	-------	116.7	(1)
Not reported	139.7	-------	-------	-------	-------	-------	-------	-------	144.9

[1] Not shown where base is less than 50.

GENERAL TABLE 93.—*Earnings of father, by average per capita income from father's earnings; live births in seven cities*

Earnings of father	Live births [1]—Total	In families with specified average per capita income from father's earnings: Less than $50	$50–$74	$75–$99	$100–$124	$125–$149	$150–$199	$200–$299	$300–$399	$400–$599	$600–$799
Total	18,587	227	1,294	1,654	2,166	2,051	2,683	4,765	3,235	503	9
Less than $450	3,077	190	801	517	698	-------	827	44	-------	-------	-------
$450–$549	2,826	31	270	552	460	659	-------	845	9	-------	-------
$550–$649	2,905	6	150	357	325	478	641	936	-------	12	-------
$650–$849	5,047	-------	71	185	526	560	764	1,238	1,691	12	-------
$850–$1,049	3,341	-------	2	41	123	323	313	1,339	1,196	-------	4
$1,050–$1,249	1,391	-------	-------	2	34	31	138	363	339	479	5

[1] Excluding live births in the "$1,250 and over," "no earnings," and "earnings not reported" groups; also a few cases in which the number in the family was not reported and those in which the infant was the only member of the family.

GENERAL TABLE 94.—*Infant mortality rates, by cause of death and economic need;*[1] *live births in seven cities*[2]

Average per capita income from father's earnings	Live births	Infant deaths							
		Number	Infant mortality rates	From gastric and intestinal diseases		From respiratory diseases		From malformations	
				Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates
Total	18,587	2,117	113.9	635	34.2	379	20.4	84	4.5
Less than $50	227	49	215.9	25	110.1	8	35.2	------	------
$50–$99	2,948	418	141.8	146	49.5	87	29.5	12	4.1
$100–$199	6,900	850	123.2	274	39.7	168	24.3	36	5.2
$200–$399	8,000	769	96.1	186	23.3	113	14.1	36	4.5
$400 and over	512	31	60.5	4	7.8	3	5.9	------	------

Average per capita income from father's earnings	Infant deaths—Continued									
	From early infancy		From epidemic and other communicable diseases		From external causes		From diseases ill defined and unknown		From other causes	
	Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates	Number	Infant mortality rates
Total	669	36.0	130	7.0	12	0.6	46	2.5	162	8.7
Less than $50	10	44.1	5	22.0	------	------	------	------	1	4.4
$50–$99	109	37.0	27	9.2	2	.7	10	3.4	25	8.5
$100–$199	248	35.9	52	7.5	2	.3	16	2.3	54	7.8
$200–$399	288	36.0	44	5.5	7	.9	20	2.5	75	9.4
$400 and over	14	27.3	2	3.9	1	2.0	------	------	7	13.7

[1] As measured by the average per capita income from father's earnings.
[2] Excluding births in the "$1,250 and over," "no earnings," and "earnings not reported" groups. See Table 134, p. 148.

GENERAL TABLE 95.—*Monthly death rates, by month of infant's life and earnings of father; infants in seven cities*

Earnings of father	Live births	Infant deaths	Infant mortality rates	Monthly death rates											
				First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
Total	21,536	2,368	110.0	44.4	9.0	7.9	7.7	7.4	7.6	6.3	5.4	5.7	5.5	3.7	4.6
Less than $450	3,085	515	166.9	55.8	15.1	13.6	15.2	12.9	11.3	12.1	10.0	9.4	11.0	8.1	5.8
$450–$549	2,827	355	125.6	46.0	10.4	11.2	8.3	5.7	12.7	9.3	4.7	4.7	6.7	4.8	8.0
$550–$649	2,908	339	116.6	43.3	10.8	6.5	7.3	8.8	7.4	9.7	9.1	7.3	5.0	3.1	4.3
$650–$849	5,050	543	107.5	46.5	8.9	8.4	7.4	9.4	4.9	4.1	4.1	5.7	4.2	3.5	5.3
$850–$1,049	3,345	277	82.8	38.0	6.5	5.0	5.0	3.2	6.0	2.2	3.8	5.5	6.1	1.9	2.3
$1,050–$1,249	1,391	89	64.0	33.1	3.0	5.2	3.0	4.5	6.8	2.3	1.5	.8	3.1	.8	1.5
$1,250 and over	2,252	133	59.1	38.2	3.7	1.9	2.8	1.4	1.9	2.3	1.9	1.4	1.4	1.4	1.9
No earnings	313	66	210.9	60.7	3.4	13.7	24.2	24.8	40.0	22.7	11.6	3.9	3.9	7.9	15.9
Not reported	365	51	139.7	41.1	20.0	11.7	8.8	8.9	3.0	6.0	12.1	21.5	3.1	9.4	3.2

GENERAL TABLE 96.—*Proportion of plural births, by earnings of father; live births in seven cities*

Earnings of father	Live births			Earnings of father	Live births		
	Total	Plural births			Total	Plural births	
		Number	Per 1,000 live births			Number	Per 1,000 live births
Total	21,536	482	22.4	$850–$1,049	3,345	75	22.4
				$1,050–$1,249	1,391	26	18.7
Less than $450	3,085	73	23.7	$1,250 and over	2,252	52	23.1
$450–$549	2,827	74	26.2	No earnings	313	6	19.2
$550–$649	2,908	67	23.0	Not reported	365	4	11.0
$650–$849	5,050	105	20.8				

GENERAL TABLE 97.—*Proportion of births to mothers who died at or within one year after confinement, by earnings of father; live births in seven cities*

Earnings of father	Live births—			Earnings of father	Live births—		
	Total	To mothers who died at or within one year after confinement			Total	To mothers who died at or within one year after confinement	
		Number	Per 1,000 live births			Number	Per 1,000 live births
Total	21,536	132	6.1	$850–$1,049	3,345	14	4.2
				$1,050–$1,249	1,391	4	2.9
Less than $450	3,085	22	7.1	$1,250 and over	2,252	10	4.4
$450–$549	2,827	16	5.7	No earnings	313	3	9.6
$550–$649	2,908	17	5.8	Not reported	365	9	24.7
$650–$849	5,050	37	7.3				

GENERAL TABLE 98.—*Relative infant mortality, by earnings of father, when influence of age of mother and order of birth, and of interval since preceding birth is eliminated; single live births in seven cities and live births in Baltimore*

Earnings of father	Deaths of single-born infants; seven cities				Infant deaths; Baltimore			
	Actual	Expected[1]	Ratio of actual to expected	Ratio of rate in specified group to average rate	Actual	Expected[1]	Ratio of actual to expected	Ratio of rate in specified group to average rate
Total	2,196	2,196.3	100.0	100.0	845	845.0	100.0	100.0
Less than $450	480	336.8	142.5	152.8	187	133.3	140.3	151.4
$450–$549	326	299.7	108.8	113.5	142	121.5	116.9	114.0
$550–$649	305	301.7	101.1	103.0	119	118.4	100.5	105.1
$650–$849	506	512.1	98.8	98.0	177	183.5	96.5	92.8
$850–$1,049	257	329.2	78.1	75.4	79	119.4	66.1	69.1
$1,050–$1,249	84	135.7	61.9	59.0	33	49.3	66.9	64.3
$1,250 and over	125	209.6	59.6	54.5	53	87.2	60.8	62.5
No earnings	64	33.4	191.6	200.0	33	15.6	211.4	200.7
Not reported	49	38.1	128.6	130.1	22	16.8	131.1	135.5

[1] Expected if the rates for each interval were applied to the live births classified by earnings of father and interval after preceding birth.

GENERAL TABLE 99.—*Prevalence of breast and artificial feeding, by month of infant's life and earnings of father; infants in eight cities*

Month of infant's life and earnings of father	Infants surviving at beginning of each specified month						
	Total [1]	Breast fed during month		Partly breast fed during month		Artificially fed during month	
		Number	Per cent	Number	Per cent	Number	Per cent
Less than $450:							
First	3,004	2,619	87.2	108	3.6	273	9.1
Second	2,913	2,302	79.0	202	6.9	406	13.9
Third	2,869	2,039	71.1	317	11.0	510	17.8
Fourth	2,830	1,764	62.3	447	15.8	616	21.8
Fifth	2,787	1,564	56.1	556	19.9	664	23.8
Sixth	2,751	1,372	49.9	668	24.3	707	25.7
Seventh	2,720	1,041	38.3	900	33.1	775	28.5
Eighth	2,687	869	32.3	1,006	37.4	808	30.1
Ninth	2,660	691	26.0	1,113	41.8	854	32.1
Tenth	2,635	540	20.5	1,196	45.4	896	34.0
Eleventh	2,606	426	16.3	1,238	47.5	939	36.0
Twelfth	2,585	368	14.2	1,238	47.9	976	37.8
$450–$549:							
First	2,759	2,416	87.6	103	3.7	240	8.7
Second	2,697	2,157	80.0	199	7.4	341	12.6
Third	2,669	1,932	72.4	277	10.4	460	17.2
Fourth	2,639	1,638	62.1	416	15.8	585	22.2
Fifth	2,617	1,476	56.4	519	19.8	622	23.8
Sixth	2,602	1,317	50.6	630	24.2	655	25.2
Seventh	2,569	1,021	39.7	849	33.0	699	27.2
Eighth	2,545	855	33.6	959	37.7	731	28.7
Ninth	2,533	679	26.8	1,075	42.4	779	30.8
Tenth	2,521	522	20.7	1,153	45.7	846	33.6
Eleventh	2,504	416	16.6	1,191	47.6	897	35.8
Twelfth	2,492	347	13.9	1,200	48.2	945	37.9
$550–$649:							
First	2,843	2,466	86.7	92	3.2	284	10.0
Second	2,782	2,172	78.1	179	6.4	431	15.5
Third	2,752	1,964	71.4	224	8.1	564	20.5
Fourth	2,734	1,695	62.0	347	12.7	692	25.3
Fifth	2,714	1,549	57.1	431	15.9	734	27.0
Sixth	2,690	1,370	50.9	541	20.1	779	29.0
Seventh	2,670	1,061	39.7	774	29.0	835	31.3
Eighth	2,644	904	34.2	874	33.1	866	32.8
Ninth	2,620	729	27.8	999	38.1	892	34.0
Tenth	2,601	543	20.9	1,113	42.8	945	36.3
Eleventh	2,588	417	16.1	1,181	45.6	990	38.3
Twelfth	2,580	360	14.0	1,179	45.7	1,041	40.3
$650–$849:							
First	4,930	4,233	85.9	134	2.7	560	11.4
Second	4,815	3,756	78.0	239	5.0	817	17.0
Third	4,772	3,379	70.8	341	7.1	1,050	22.0
Fourth	4,732	2,970	62.8	507	10.7	1,253	26.5
Fifth	4,697	2,718	57.9	637	13.6	1,340	28.5
Sixth	4,653	2,440	52.4	799	17.2	1,412	30.3
Seventh	4,630	1,952	42.2	1,174	25.4	1,502	32.4
Eighth	4,611	1,678	36.4	1,380	29.9	1,551	33.6
Ninth	4,592	1,363	29.7	1,593	34.7	1,634	35.6
Tenth	4,566	1,022	22.4	1,804	39.5	1,738	38.1
Eleventh	4,547	787	17.3	1,941	42.7	1,817	40.0
Twelfth	4,531	630	13.9	1,978	43.7	1,921	42.4
$850–$1,049:							
First	3,266	2,810	86.0	86	2.6	369	11.3
Second	3,218	2,508	77.9	153	4.8	554	17.2
Third	3,197	2,304	72.1	202	6.3	688	21.5
Fourth	3,181	2,054	64.6	304	9.6	820	25.8
Fifth	3,165	1,887	59.6	374	11.8	901	28.5
Sixth	3,155	1,694	53.7	488	15.5	970	30.7
Seventh	3,136	1,360	43.4	735	23.4	1,038	33.1
Eighth	3,129	1,173	37.5	860	27.5	1,093	34.9
Ninth	3,117	937	30.1	1,046	33.6	1,131	36.3
Tenth	3,100	683	22.0	1,186	38.3	1,227	39.6
Eleventh	3,081	521	16.9	1,275	41.4	1,281	41.6
Twelfth	3,075	422	13.7	1,314	42.7	1,337	43.5
$1,050–$1,249:							
First	1,362	1,170	85.9	37	2.7	155	11.4
Second	1,345	1,044	77.6	66	4.9	235	17.5
Third	1,341	942	70.2	79	5.9	320	23.9
Fourth	1,334	807	60.5	126	9.4	401	30.1
Fifth	1,330	747	56.2	149	11.2	434	32.6
Sixth	1,324	677	51.1	192	14.5	455	34.4
Seventh	1,315	554	42.1	283	21.5	478	36.3
Eighth	1,312	466	35.5	346	26.4	500	38.1
Ninth	1,310	354	27.0	425	32.4	531	40.5
Tenth	1,309	245	18.7	490	37.4	574	43.9
Eleventh	1,305	173	13.3	533	40.8	599	45.9
Twelfth	1,304	145	11.1	531	40.7	628	48.2

GENERAL TABLE 99.—*Prevalence of breast and artificial feeding, by month of infant's life and earnings of father; infants in eight cities*—Continued

Month of infant's life and earnings of father	Infants surviving at beginning of each specified month						
	Total	Breast fed during month		Partly breast fed during month		Artificially fed during month	
		Number	Per cent	Number	Per cent	Number	Per cent
$1,250 and over:							
First	2,200	1,878	85.4	72	3.3	249	11.3
Second	2,166	1,647	76.0	124	5.7	395	18.2
Third	2,158	1,485	68.8	165	7.6	508	23.5
Fourth	2,154	1,294	60.1	239	11.1	621	28.8
Fifth	2,148	1,176	54.7	282	13.1	690	32.1
Sixth	2,145	1,074	50.1	337	15.7	734	34.2
Seventh	2,141	847	39.6	473	22.1	821	38.3
Eighth	2,136	733	34.3	528	24.7	875	41.0
Ninth	2,132	585	27.4	618	29.0	929	43.6
Tenth	2,129	399	18.7	703	33.0	1,027	48.2
Eleventh	2,126	272	12.8	763	35.9	1,091	51.3
Twelfth	2,123	209	9.8	771	36.3	1,143	53.8
No earnings:							
First	304	249	81.9	3	1.0	51	16.8
Second	294	195	66.3	29	9.9	69	23.5
Third	293	163	55.6	45	15.4	85	29.0
Fourth	289	135	46.7	59	20.4	95	32.9
Fifth	282	117	41.5	63	22.3	102	36.2
Sixth	275	106	38.5	70	25.5	99	36.0
Seventh	264	81	30.7	85	32.2	98	37.1
Eighth	258	68	26.4	91	35.3	99	38.4
Ninth	255	55	21.6	98	38.4	102	40.0
Tenth	254	35	13.8	112	44.1	107	42.1
Eleventh	253	22	8.7	122	48.2	109	43.1
Twelfth	251	17	6.8	121	48.2	113	45.0
Not reported:							
First	354	290	81.9	10	2.8	54	15.3
Second	350	238	68.0	28	8.0	84	24.0
Third	343	209	60.9	40	11.7	93	27.1
Fourth	339	185	54.6	54	15.9	98	28.9
Fifth	336	170	50.6	58	17.3	106	31.5
Sixth	333	149	44.7	70	21.0	113	33.9
Seventh	332	115	34.6	91	27.4	126	38.0
Eighth	330	100	30.3	98	29.7	132	40.0
Ninth	326	69	21.2	115	35.3	142	43.6
Tenth	319	50	15.7	121	37.9	148	46.4
Eleventh	318	36	11.3	127	39.9	155	48.7
Twelfth	315	27	8.6	128	40.6	160	50.8

[1] Excluding those who died not fed.

GENERAL TABLE 100.—*Type of feeding during first nine months of life, by earnings of father; infants in seven cities*

Earnings of father	Months lived from birth to end of ninth							
	Total	Months of breast feeding		Months of partly breast feeding		Months of artificial feeding		Type of feeding not reported (number)[1]
		Number	Per cent	Number	Per cent	Number	Per cent	
Total	180,412.0	102,768.5	57.0	31,412.0	17.4	46,149.5	25.6	82.0
Less than $450	25,036.5	14,196.5	56.7	5,291.5	21.1	5,520.0	22.0	28.5
$450–$549	23,511.0	13,451.5	57.2	5,012.0	21.3	5,047.5	21.5	----
$550–$649	24,328.0	13,871.5	57.0	4,445.0	18.3	6,011.0	24.7	.5
$650–$849	42,250.0	24,413.5	57.8	6,788.0	16.1	11,028.5	26.1	20.0
$850–$1,049	28,481.0	16,697.5	58.6	4,240.0	14.9	7,518.5	26.4	25.0
$1,050–$1,249	11,946.5	6,750.0	56.5	1,701.0	14.2	3,495.5	29.3	----
$1,250 and over	19,344.5	10,703.5	55.3	2,834.5	14.7	5,806.0	30.0	.5
No earnings	2,489.0	1,164.0	46.8	539.0	21.7	784.0	31.5	2.0
Not reported	3,025.5	1,520.5	50.3	561.0	18.5	938.5	31.0	5.5

[1] Per cent not shown for "not reported" group because not significant.

GENERAL TABLE 101.—*Monthly death rates, by type of feeding, earnings of father, and month of life; infants in seven cities*

Month of life and type of feeding	Monthly death rates:[1] Earnings of father								
	Less than $450	$450–$549	$550–$649	$650–$849	$850–$1,049	$1,050–$1,249	$1,250 and over	No earnings	Not reported
First month	55.8	46.0	43.3	46.5	38.0	33.1	38.2	60.7	41.1
Breast fed	22.5	15.3	17.0	20.1	11.4	7.7	11.2	16.1	10.3
Partly breast fed	27.8	38.8	32.6	52.2	11.6	----	41.7	----	----
Artificially fed	98.9	87.5	52.8	41.1	40.7	51.6	36.1	98.0	18.5
Second month	15.1	10.4	10.8	8.9	6.5	3.0	3.7	3.4	20.0
Breast fed	10.4	6.0	5.1	5.3	2.4	2.9	2.4	5.1	12.6
Partly breast fed	14.9	15.1	33.5	8.4	13.1	----	8.1	----	71.4
Artificially fed	41.9	35.2	30.2	25.7	23.5	4.3	7.6	----	23.8
Third month	13.6	11.2	6.5	8.4	5.0	5.2	1.9	13.7	11.7
Breast fed	6.9	5.7	2.0	3.6	2.2	1.1	2.0	6.1	----
Partly breast fed	25.2	18.1	17.9	8.8	5.0	25.3	----	----	----
Artificially fed	33.3	30.4	17.7	23.8	14.5	12.5	2.0	35.3	43.0
Fourth month	15.2	8.3	7.3	7.4	5.0	3.0	2.8	24.2	8.8
Breast fed	5.7	4.3	2.4	2.7	2.9	2.5	----	14.8	5.4
Partly breast fed	13.4	7.2	8.7	3.9	6.6	----	4.2	67.8	----
Artificially fed	43.8	20.5	18.8	20.0	9.8	5.0	8.1	10.5	20.4
Fifth month	12.9	5.7	8.8	9.4	3.2	4.5	1.4	24.8	8.9
Breast fed	5.1	2.7	3.2	4.0	.5	4.0	----	----	----
Partly breast fed	10.8	1.9	11.6	4.7	2.7	----	----	----	----
Artificially fed	33.1	16.1	19.1	22.4	8.9	6.9	4.3	68.6	18.9
Sixth month	11.3	12.7	7.4	4.9	6.0	6.8	1.9	40.0	3.0
Breast fed	4.4	1.5	1.5	2.5	1.2	3.0	.9	9.4	----
Partly breast fed	10.5	6.3	7.4	3.8	6.1	5.2	----	14.3	----
Artificially fed	25.5	41.2	18.0	9.9	14.4	13.2	4.1	90.9	8.8
Seventh month	12.1	9.3	9.7	4.1	2.2	2.3	2.3	22.7	6.0
Breast fed	2.9	2.0	1.9	1.0	.7	3.6	----	12.3	----
Partly breast fed	8.9	5.9	5.2	.9	----	3.5	4.2	11.8	----
Artificially fed	28.4	24.3	24.0	10.7	5.8	----	3.7	40.8	15.9
Eighth month	10.0	4.7	9.1	4.1	3.8	1.5	1.9	11.6	12.1
Breast fed	1.2	2.3	6.6	1.8	1.7	----	2.7	----	----
Partly breast fed	7.0	3.1	2.3	3.6	----	----	----	11.0	10.2
Artificially fed	22.3	9.6	18.5	7.1	9.1	4.0	2.3	20.2	22.7
Ninth month	9.4	4.7	7.3	5.7	5.5	.8	1.4	3.9	21.5
Breast fed	5.8	1.5	1.4	2.9	4.3	----	----	----	29.0
Partly breast fed	2.7	1.9	1.0	3.8	5.7	----	----	----	26.1
Artificially fed	21.1	11.6	19.1	9.8	6.2	1.9	3.2	9.8	14.1
Tenth month	11.0	6.7	5.0	4.2	6.1	3.1	1.4	3.9	3.1
Breast fed	13.0	1.9	1.8	4.9	----	4.1	----	----	----
Partly breast fed	4.2	2.6	3.6	1.7	3.4	2.0	----	----	----
Artificially fed	19.0	15.4	8.5	6.3	12.2	3.5	2.9	9.3	6.8
Eleventh month	8.1	4.8	3.1	3.5	1.9	.8	1.4	7.9	9.4
Breast fed	4.7	----	----	3.8	----	----	----	----	27.8
Partly breast fed	7.3	3.4	.8	1.0	----	----	----	----	15.7
Artificially fed	10.6	8.9	7.1	6.1	4.7	1.7	2.7	18.3	----
Twelfth month	5.8	8.0	4.3	5.3	2.3	1.5	1.9	15.9	3.2
Breast fed	10.9	11.5	----	4.8	2.4	----	----	----	----
Partly breast fed	3.2	4.2	5.1	2.5	.8	----	----	8.3	----
Artificially fed	7.2	11.6	4.8	8.3	3.7	3.2	3.5	26.5	6.2

[1] Not shown where base is less than 25.

GENERAL TABLE 102.—*Infant mortality rates, by earnings of father and color and nativity of mother; live births in seven cities*

Earnings of father	Births to all mothers			Births to native white mothers			Births to foreign-born white mothers			Births to colored mothers		
	Live births	Infant deaths	Infant mortality rates [1]	Live births	Infant deaths	Infant mortality rates [1]	Live births	Infant deaths	Infant mortality rates [1]	Live births	Infant deaths	Infant mortality rates [1]
Total	21,536	2,368	110.0	11,323	1,063	93.9	8,762	1,084	123.7	1,451	221	152.3
Less than $450	3,085	515	166.9	653	111	170.0	1,885	315	167.1	547	89	162.7
$450–$549	2,827	355	125.6	926	112	121.0	1,504	178	118.4	397	65	163.7
$550–$649	2,908	339	116.6	1,390	154	110.8	1,347	164	121.8	171	21	122.8
$650–$849	5,050	543	107.5	2,914	290	99.5	1,990	238	119.6	146	15	102.7
$850–$1,049	3,345	277	82.8	2,291	175	76.4	1,012	96	94.9	42	6	-------
$1,050–$1,249	1,391	89	64.0	1,070	67	62.6	307	21	68.4	14	1	-------
$1,250 and over	2,252	133	59.1	1,770	102	57.6	467	28	60.0	15	3	-------
No earnings	313	66	210.9	128	24	187.5	111	26	234.2	74	16	-------
Not reported	365	51	139.7	181	28	154.7	139	18	129.5	45	5	-------

[1] Not shown where base is less than 100.

GENERAL TABLE 103.—*Proportion of confinements with instrumental delivery, by earnings of father; confinements in Baltimore*

Earnings of father	Total confinements [1]	Confinements with instrumental delivery		Earnings of father	Total confinements [1]	Confinements with instrumental delivery	
		Number	Per cent			Number	Per cent
Total	11,463	[2] 866	7.6	$850–$1,049	1,675	160	9.6
				$1,050–$1,249	696	70	10.1
No earnings	232	10	4.3	$1,250–$1,449	444	47	10.6
Less than $450	1,668	72	4.3	$1,450 and over	846	120	14.2
$450–$649	3,117	176	5.6	Not reported	239	29	12.1
$650–$849	2,546	182	7.1				

[1] Including confinements resulting in miscarriages of less than 7 months' gestation.
[2] Confinements resulting in plural births counted but once.

APPENDIX E.—CHARTS

CHART I.—DEATHS FROM RESPIRATORY AND FROM GASTRIC AND INTESTINAL DISEASES, BY MONTH OF DEATH

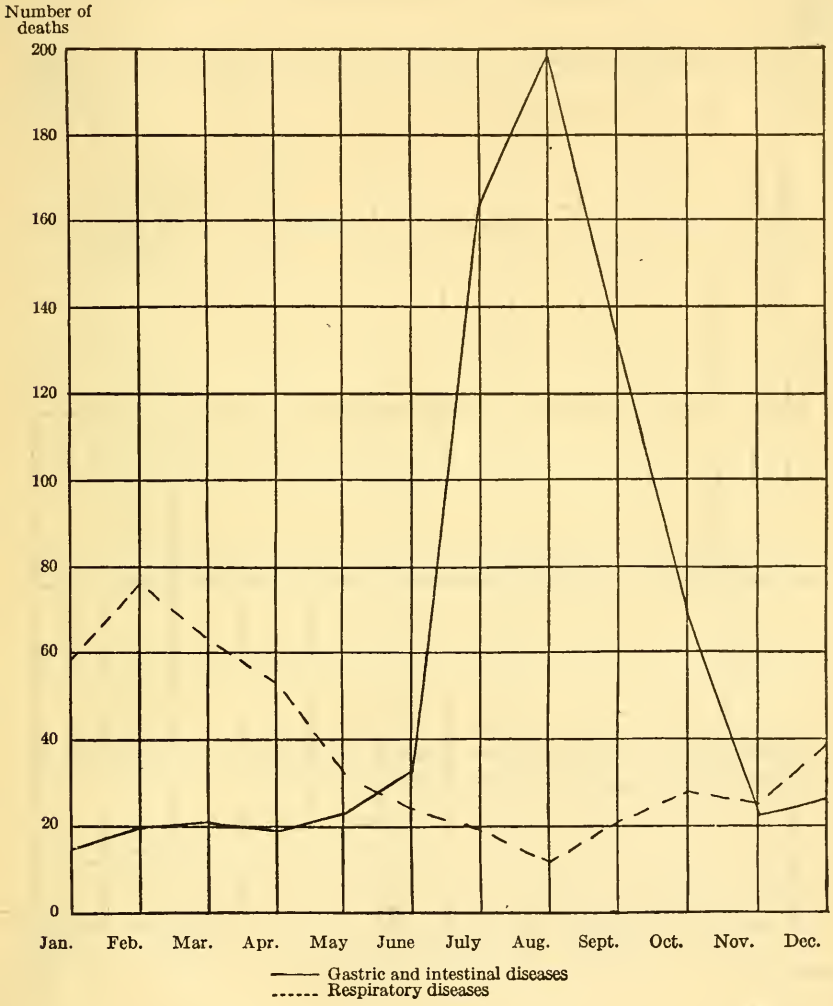


CHART II.—MONTHLY DEATH RATES, BY MONTH OF LIFE

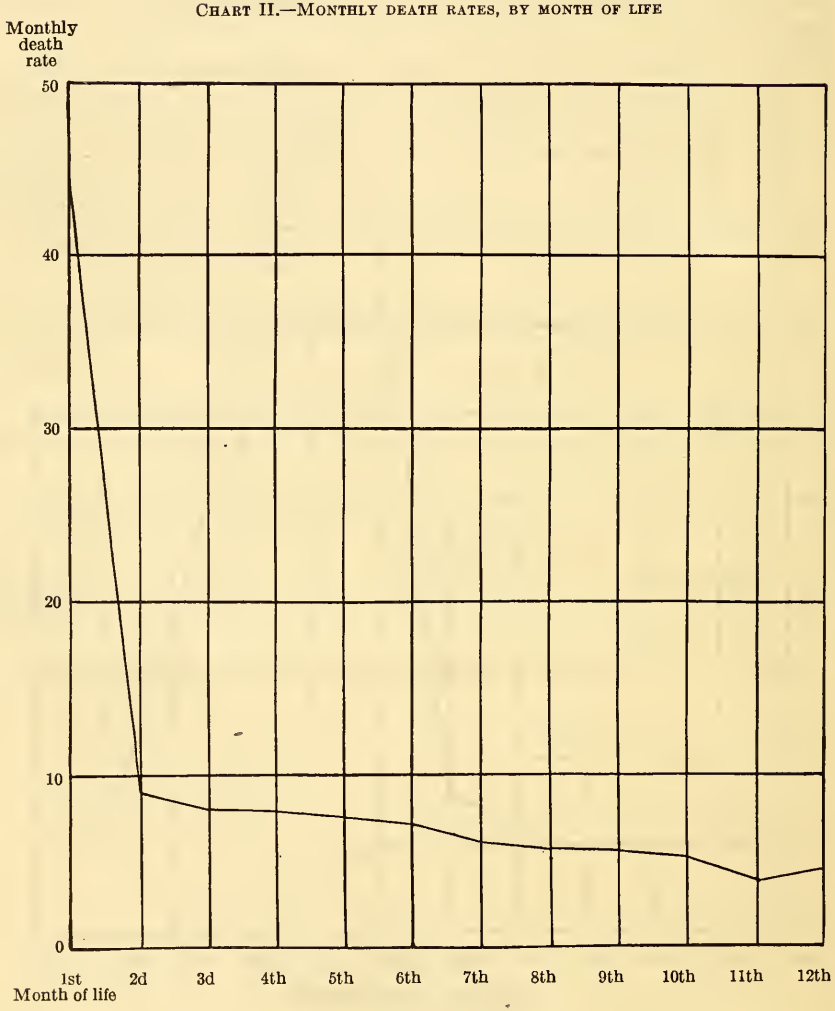


CHART III.—INFANT MORTALITY RATES, BY AGE OF MOTHER

CHART IV.—INFANT MORTALITY RATES, BY ORDER OF BIRTH

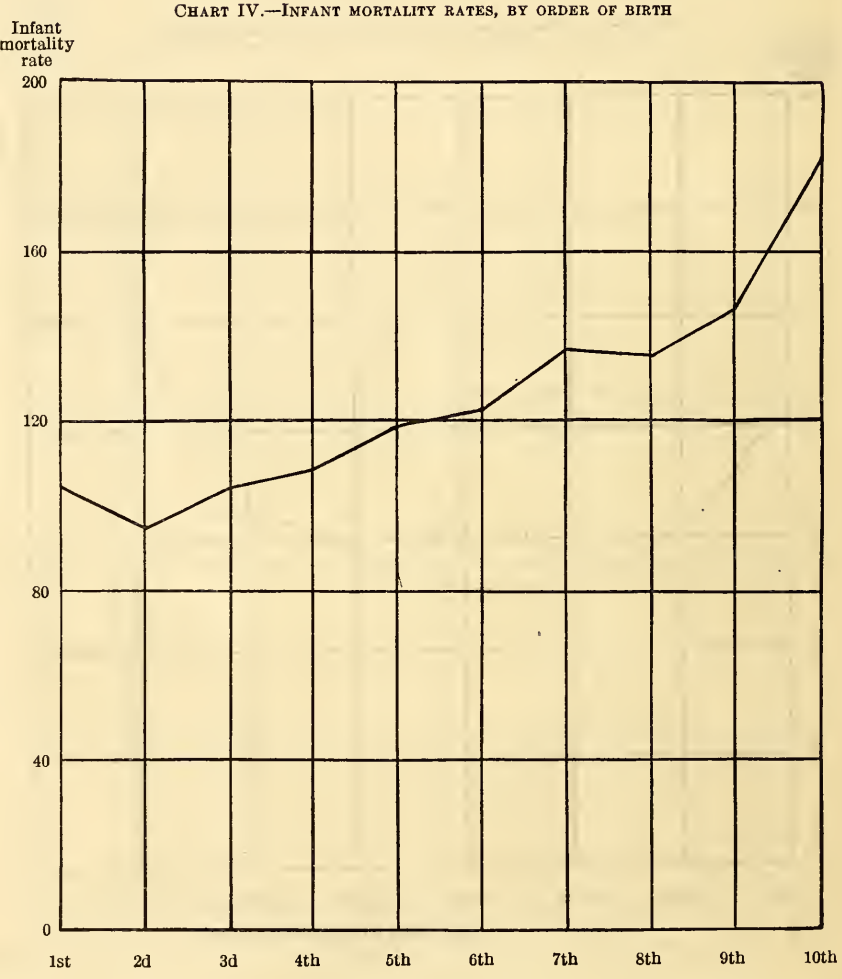


CHART V.—INFANT MORTALITY RATES, BY INTERVAL SINCE PRECEDING BIRTH

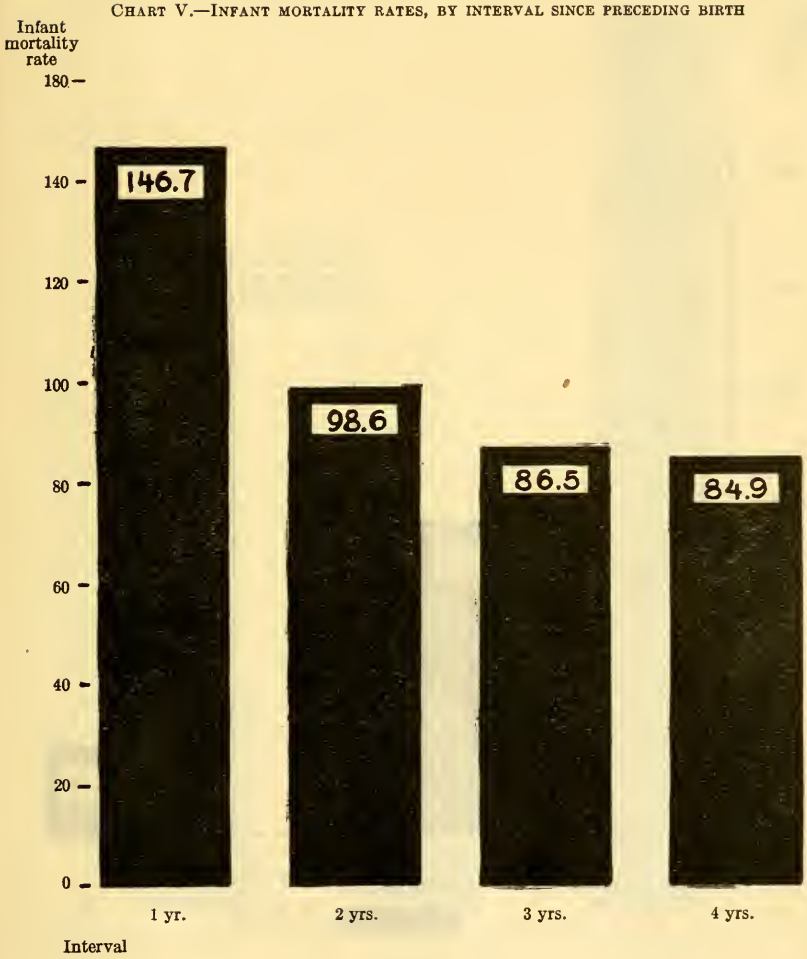


CHART VI.—INFANT MORTALITY RATES FOR SINGLE AND PLURAL, PREMATURE AND FULL-TIME BIRTHS

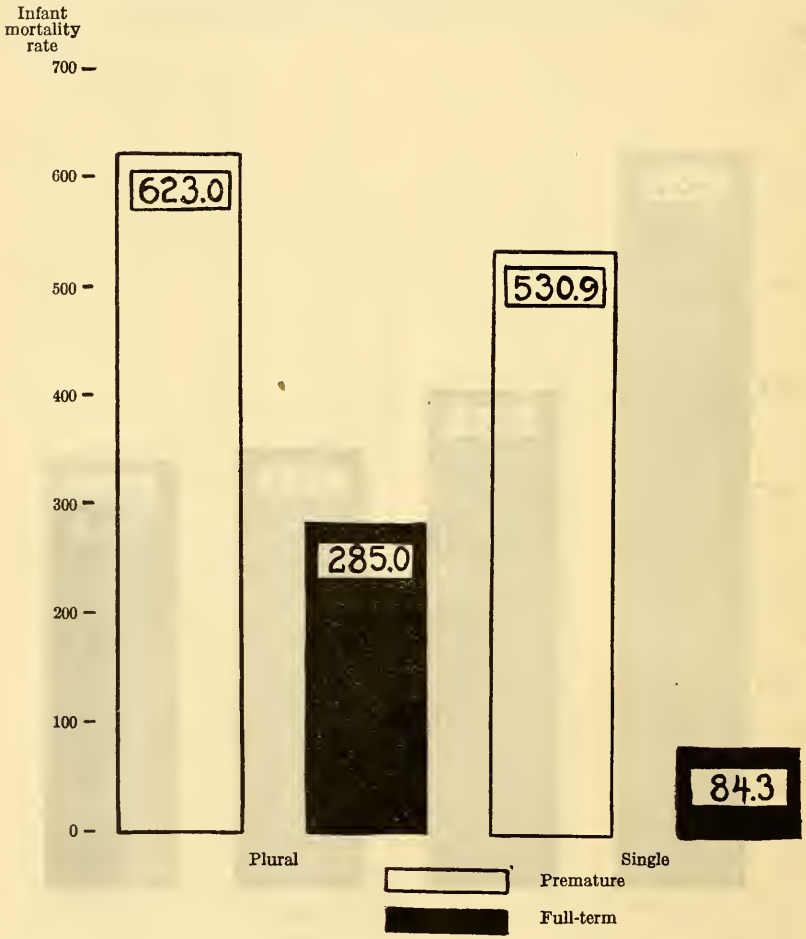


CHART VII.—RELATIVE MORTALITY, BY TYPE OF FEEDING

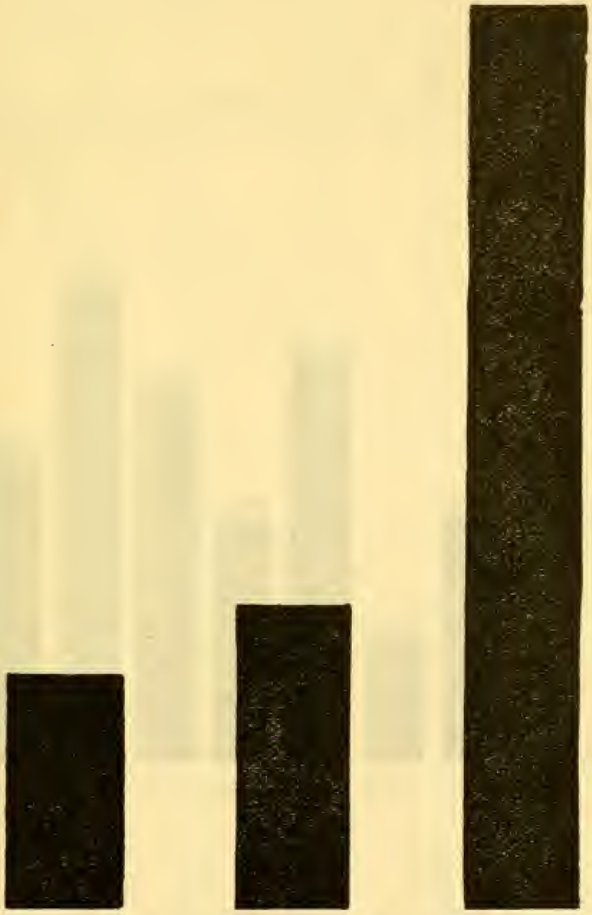


CHART VIII.—INFANT MORTALITY RATES, BY COLOR AND NATIONALITY OF MOTHER

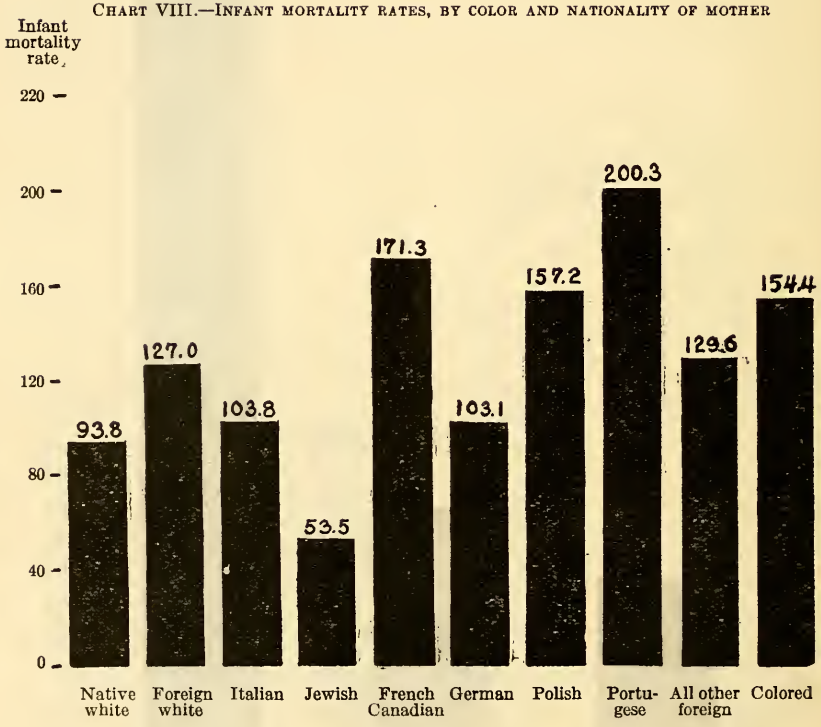
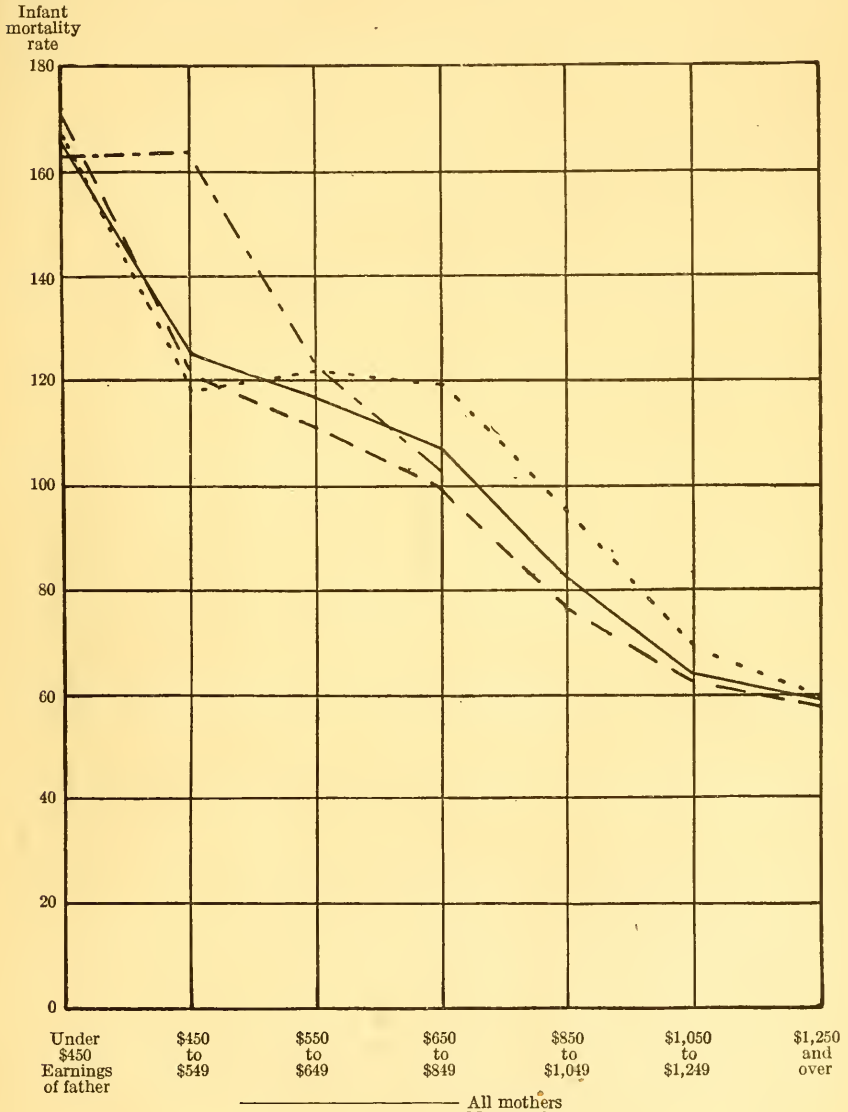


CHART IX.—INFANT MORTALITY RATES, BY COLOR AND NATIVITY OF MOTHERS AND EARNINGS OF FATHER



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